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VOLUME 33 NUMBER 4

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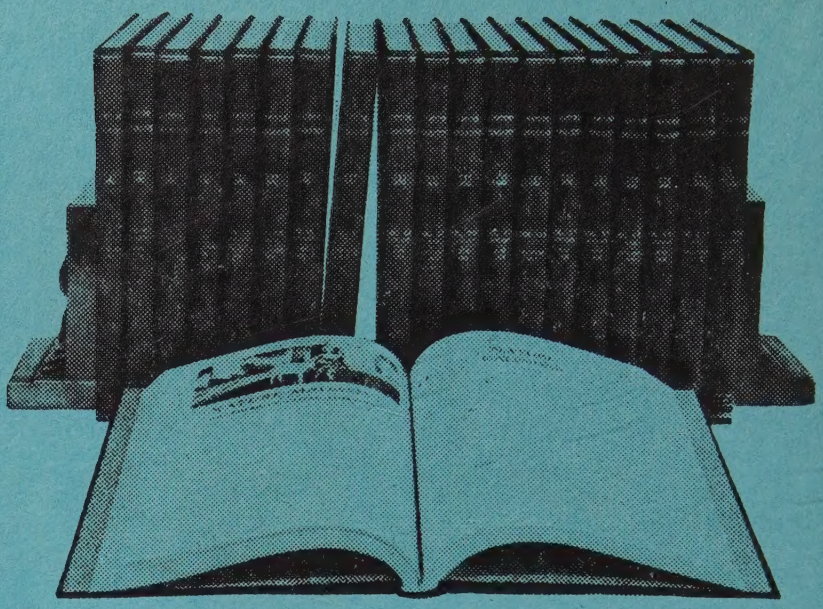

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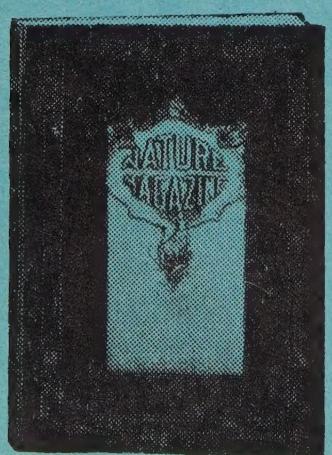

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NATURE IN PRINT

As a convenience to readers the books reviewed in the pages of Nature Magazine may be ordered through the book department of the American Nature Association, 1214 16th St., Washington, D. C.

Our Indians

If we would know the history of our country thoroughly we must know the history of the original Americans—the Indian nations from whom we wrested this country, and, in so doing, left a record of which we have no reason as a people to be proud. We cannot retrace those steps, or undo what was done, but, as Americans, we should inform ourselves of these earlier people. An excellent way to do this would be by reading *Indians of the United States*, by Clark Wissler, Curator of Anthropology of the American Museum of Natural History. This is a book for the general reader, well-written and, in many places, dramatic. Published by Doubleday, Doran and Company, it sells for $3.75.

Ways of Life

Green Kingdom is the alluring title that has been given to a new book in the Way of Life Series being published by Row, Peterson and Company of Evanston, Illinois. This series, as may be guessed, deals with the manner of life of various callings, in this instance the way of life of a forest ranger. The publishers chose wisely when they selected William Atherton DuPuy to write this little book, because he has written extensively about our National Forests and our National Parks, and knows intimately the work of the two great government services administering these natural resources. *Green Kingdom* is a little book—sixty-four pages—attractively illustrated and printed, and sells for one dollar.

Knowing the Trees

The most recent addition to the "Pictured-Key Nature Series", prepared and published by H. E. Jaques, is entitled *How to Know the Trees*. It is an excellent practical guide with line drawings that are simple aids to identification. Published in the spiral binding at one dollar, and the cloth binding at $1.80, this and its companion books should prove most popular. Copies are available from the author at 709 North Main Street, Mt. Pleasant, Iowa.

New Editions

Revised editions of *Adventures of a Bird Watcher*, and *Bird Songs*, both published by the Palisade Press, 280 Broadway, New York City, are being brought out. They have been reduced to one dollar each in the new edition.

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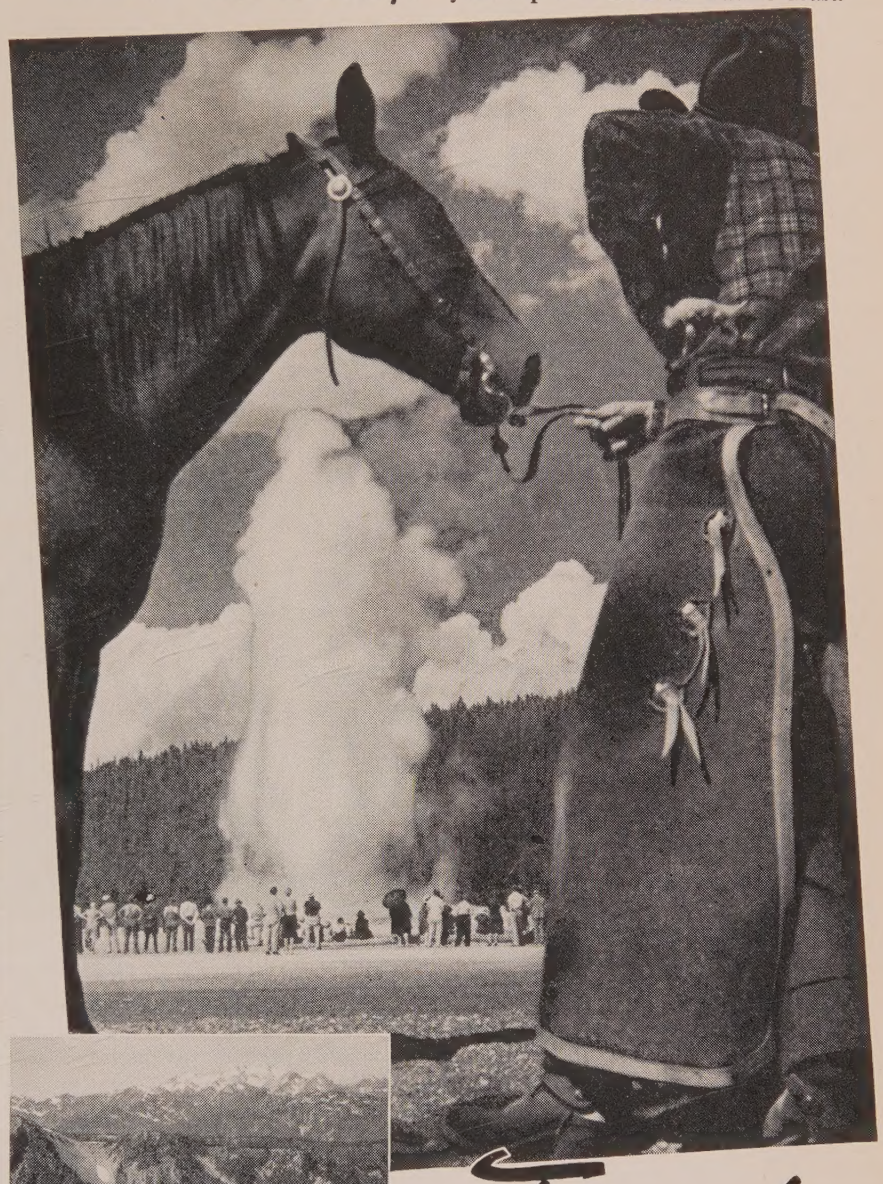

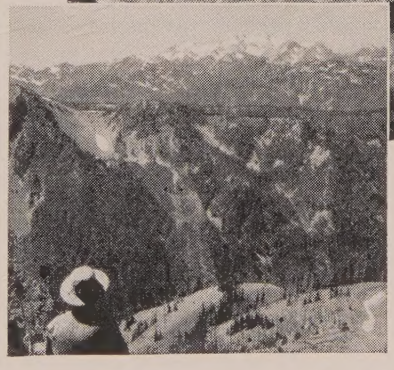

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Camera Trails

BY NORRIS W. HARKNESS

"ESPRIT DES BOIS" IS THE TITLE H. H. SHELDON OF BEND, OREGON, GIVES TO THIS PRIZE-WINNING PICTURE

Depth of Field

One of the questions I am frequently asked involves depth of field (or depth of focus as it is sometimes incorrectly called), and the whole subject has been made very complicated instead of the simple thing that it really is.

To get down to definitions, the field of the camera is that part of the landscape that is recorded on the film. It might well be called the field of vision of the camera, and usually involves an angle of about 45 degrees with ordinary cameras. All this field will be visible in our negatives, but it will not all be equally sharp and some part of the picture will be much more sharply focused than other parts. Depth of field, then, refers to that part of the picture that is focused sharply enough for our purposes, and we might call the term "depth of usably sharp field" rather than simply depth of field. This usable field always begins at some distance from the camera and extends past the point upon which the camera is focused to some distance beyond it. Nearer the camera than that minimum distance, or farther away than the maximum distance, the image on our film will be too fuzzy and too out of focus to be sufficiently clear in our picture. The extent of this usable field, that is the actual depth of focus, depends upon three things: the focal length of our lens, the distance focused upon, and the aperture at which our diaphragm is set. The usable field is greater with shorter focal length lens, greater focusing distance and smaller stops. In other words, a 2-inch lens—one with a 2-inch focal length such as we would probably find on a 35 mm camera—would have a considerably greater depth of focus than a 6-inch lens if both were focused on the same distance and set to the same stops. Either lens would have a much greater depth if focused on 50 feet rather than on the 5-foot mark, and any lens has much greater depth at f/22 than at f/8. Diagrams supplied by manufacturers give sufficient comparative data to show the photographer how the depth of field changes as the diaphragm openings are decreased. At f/4 the 2-inch lens will give a perfect image from 13 feet to 40 feet, while the 6-inch lens will be in focus from 19 feet, 3 inches. At f/22 the 2-inch lens is in focus from 5 feet to infinity, while the lower lens is in focus from 16 feet to 25 feet. This means that everything between those distances will be wire sharp in our picture, and the definition of objects beyond the limits will be progressively less sharp as they get farther from the focusing distance.

Now let us see how we can make use of this information. Since most of us have cameras that are equipped only with one lens we may consider that the factors that control the depth of field in our pictures are simply the focusing distance and the aperture that we may use. And it follows that for any distance upon which we focus the camera the depth of field is least with the lens wide open. For pictures, then, in which we wish to place all the emphasis on some one object, subduing nearer and farther things as much as possible, we would focus sharply on that object and open the lens wide. This procedure makes the other objects within the camera's sight less sharply focused and therefore less important. If, on the other hand, we wish to include those nearer and farther objects more prominently in our picture we stop the lens down making them sharp as well. The use of the wide-open lens is particularly valuable when the backgrounds have a tendency to detract from the main object in our picture. A picture of a flower, for example, is much stronger if the plane of the flower itself is the only sharp one we can see, and if we are making a shot of the little girl next door we can oft-times keep the corner of the porch or the flower pot behind her from seeming to grow out of her head or shoulder by opening the lens wide and giving a correspondingly short exposure.

To sum it all up in a word, if you wish to include a great deal in a picture stop your lens down, and if you wish to concentrate all the interest on some one plane use the widest aperture available to you. The depth of field table, which probably came with your camera, will be valuable, and it lists two sets of figures for each stop and for each focusing distance. The smaller of these figures will be the minimum distance from the camera at which an object will be sharp, and the larger will be the maximum distance at which an important object can be placed in our picture.

To see the effect of depth of field, I would suggest that you make two exposures of the same scene while you focus on some important object, say 15 feet from the camera. Make the first with the lens wide open and the second with it stopped down as far as possible. Give the exposures as required by the meter—and naturally the second will be far longer—and compare the prints resulting from these negatives. You will find that the use of the ideas that these two prints will suggest will be of real assistance in bringing out exactly the effect you wish.

Washburn Pictures

I would like to call the attention of every Camera Trailer to the February fifth issue of LIFE, which you can probably find in your local library. Pages 6, 7 and 9 show a number of pictures assembled by Bradford Washburn, Director of the New England Museum of Natural History in Boston. While we cannot all wander to the far places in which some of these pictures were made, most of us find near our homes animals comparable in interest to the frog or the fiddler crab.

The thing I want to point out particularly is the difference in photographic quality that is permissible in different kinds of subject

matter. The kangaroo and snake pictures are not as good photographically as the others because of the extremely difficult circumstances under which they were made, and the necessity of working so rapidly in making the exposures. This latter circumstance also applies somewhat to the shot of the gannet. The owl picture is a flash shot and contains its own proof of its authenticity. The remaining three pictures were posed, or at least give that impression, and show signs of having been made under more favorable circumstances. The definition throughout each picture is perfect and the poses are extremely alive.

To entrants in our contest there is a hint in these pictures. While we must keep in mind the absolute necessity for an attractive and artistic setting that is at the same time appropriate to our subject, we can often improve our chances of making our picture photographicaliy excellent as well by moving our interesting object to a better spot than

"BROWN THRASHER"—PRIZE-WINNING PICTURE BY HUGH M. HALLIDAY, OF TORONTO, CANADA

the one in which we found it, provided, of course, we do not give it an unnatural setting. A frog, for example, might be nearly lost in its surroundings due to its protective coloring, or a plant might have a background full of distractions. If we work carefully we can probably move either subject—though it may not be easy—to a more favorable setting and our pictures will benefit accordingly. We must always keep in mind the fact that we are first making pictures. Their value, both in the contest and in your permanent files, will depend primarily upon their photographic excellence, then upon their appeal as pictures and finally upon the rarity of their subject matter.

Here is another hint for contest entrants. Due to the fact that pictures of fauna have a greater degree of human interest than equally good work on flora, the judges have found it difficult to give pictures in this latter class sufficient attention. We have, therefore, decided to set aside the November contest entirely for pictures of flowers and plants, and all pictures in this classification that have not already received prizes will be re-entered in the contest for that month. Comparatively few of the prints received thus far have been in this class, and we have picked the November issue so that every Camera Trailer will have an opportunity to submit the entries that he may make throughout the summer. Remember that pictures for the November Contest must be in my hands by September 15. Mail each entry, with your name and address on the back, to Norris W. Harkness, 320 East 42nd Street, New York City.

The April Contest

The task of the judges was extremely difficult this month as there were seven pictures that ran almost neck and neck. After considerable debate on print quality, composition, human interest, and, finally, rarity of subject and the difficulty encountered in making the shot, we came up with "L'Esprit des Bois" by H. H. Sheldon of Bend, Oregon, and "The Brown Thrasher" by Hugh M. Halliday of Toronto, Canada. Mr. Halliday was one of the winners last month, too, and made two of the Honorable Mention prints that caused the judges so much difficulty. The other Honorable Mentions—and we cannot reduce the number to the customary two, —were made by H. B. Gray of Long Branch, California—a fine shot of one lizard eating another—; Oscar H. Stroh of Gainesville, Florida—a salamander—; Miss M. A. Briggs of Beynen, Alberta, Canada,—"Crocuses".

My most sincere congratulations to the makers of these fine pictures. I only hope that we shall be able to reproduce them at a later date.

Remember that the winning prints earn for their makers a copy of any one of the following books and a shot at the $25 merchandise award from Willoughbys Inc., at the end of the year: Photo-Lab Index by Henry M. Lester; Nature Photography Around the Year by Percy A. Morris; New Ways in Photography by Jacob Deschin; Finding New Subjects for Your Camera by Jacob Deschin; The Fun of Photography by Mabel and Mario Scacheri; Photography by Dr. C. E. K. Mees; Eyes in the Night by Tappan Gregory.

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(Continued on page 239)

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Hydro-Sand Culture

A new system of growing plants without soil has been developed by Mr. D. R. Matlin, Professor of Plant Chemiculture at Belmont Evening High School, Los Angeles, California. He calls this "Hydro-Sand Culture", because it is a combination of the advantages of the historic methods of sand or gravel culture. The disadvantage of sand culture is that it requires several pumpings of water or nutrient solution daily to prevent the sand from drying out. Someone must be present to watch the tanks daily, otherwise the plants would die. The objections to water culture are difficulty of germination, use of excelsior or material that may be toxic to plants, poor support of plants, excessive evaporation and lack of hair roots. By means of hydro-sand culture, all of these disadvantages are remedied.

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About Ecuador

Victor Wolfgang von Hagen has contributed a number of interesting articles to *Nature Magazine*, usually about the wildlife of out-of-the-way places. Some of these have dealt with Ecuador, and of the Galapagos Islands, which are the property of that republic. Because the author's interests are chiefly in natural history, this is the emphasis in his new book *Ecuador the Unknown*. In two and one-half years of travel and study in this country, von Hagen has brought to light many interesting facts and the result is a most entertaining and informative book. It is published by the Oxford University Press at $3.50.

About a Woodchuck

Chuckle was a woodchuck, an amiable fellow who had many adventures in the small world not far from his burrow. His story is told by David M. Stearns in an attractive little juvenile book entitled *Chuckle*. Sharon Stearns brings Chuckle to life in a number of charming pictures. The youngsters will love it. The publishers are Farrar and Rinehart and the price one dollar.

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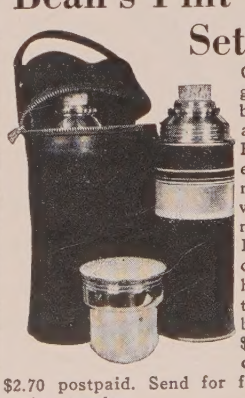

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Indoors and Out

By HOWARD ZAHNISER

"In April a day comes to the banks of the Hudson when the sun shines, small white clouds ride on soft air blowing steadily upriver and the silver-backed shad are running," writes Carl Carmer in his book on the Hudson in "The Rivers of America" series.* There are many of us who would only reluctantly live much of our life far from a river during any season of the year. As Julian Dana remarks in his book on the Sacramento in this same series, rivers bring rhythm to a boy's world, and "that rhythm is never quite lost to boys grown older," or girls either, he might have added as a matter of course. Yet it seems to me that spring is of all seasons the one in which a body most longs to be at least a riparian sort of person. Why this should seem so is a pleasant speculation. Blair Niles devotes four pages of her James River volume to as pretty a sketch of the seasons remembered from childhood as one might hope to read, and she writes of spring as "a season of eager excitement," with hyacinths, daffodils, and violets blooming, the trees in sudden leaf, and the birds "hanging nests from their branches, or tucking them away in shrubbery." Undoubtedly the eager excitement of spring responds to the flowing waters of swollen streams, and one's intuitive awareness of the new beginnings of life all around is quickened sometimes tremblingly at the sight of the seasonal rapidity of a river that is constantly flowing, year in and year out. The gentle sport of angling, it has always seemed to me, is in spring most in danger of those surges of excitement almost inconsistent with its reputation as contemplative. The excitements of April trout fishing are more memorable to me than its broodings, and I attribute much more to the streams than to the fish that came out of them. Even in the library interest runs easily to rivers in April.

Appreciation of those who share such tastes must certainly be very high for an entire series of books on rivers. The only general complaint that many might make is that these books are so much more riparian than riverine. Designed by the late Constance Lindsay Skinner as an appropriate way of telling the folk story of the American people, the various books are primarily concerned with human living in the river valleys rather than with the rivers themselves, and one can hardly expect of a book what is not offered. We see in them, not the rivers so much, but what the streams themselves might have seen. They are interesting reading, indeed, to every American, written after much research, illustrated with freshness and good taste, well edited with indexes and lists of references, and all the more appealing to outdoor folk because the stories are at least told in terms of rivers.

Blair Niles begins by pointing out that "when you look down from a thousand feet in the air, you see, not only James River, but a wide sweep of tidewater Virginia." She seldom comes any nearer to her title stream but continues with her wide sweep, writing a delightfully informal book with all the intense, patriotic interest of the stories that Virginians love to tell, and we all love to hear, about Captain John Smith, Robert E. Lee, and even George Washington along the Potomac—telling them with the romance that most things Virginian have for both northerners and southerners. Even in the sketch of the seasons that I found so delightful I found no reference to a river though prompted to a re-reading by my decidedly dry-land impression. This is an excellent book but hardly even riparian when one gets a few paragraphs away from the title page.

Mr. Carmer and Mr. Dana come much closer to staying near the middle of the stream of their books. *The Hudson* is an especially desirable book from many points of view, among them that of interest in rivers as streams of water. Its first chapter tells of how the river was "made," including a description of the tremendous canyon once used by the river but now covered by ocean. Throughout the work one is indeed conscious of the river's presence, whether the author is concerned, for example, with the livelihood of the valley folk or their artistic tastes reflected in the famous Hudson River School of painters, and Mr. Carmer's concluding chapter, "Flow On," comes close to the deep interests of everyone who loves a river.

"The Hudson of the people's dream," he writes, "is a river of clean waters. . . . The people of the big valley know that cleaning Hudson water will take time—but they know, too, that it will be done. . . . The time will come —the people have dreamed it—when the river running down from its high source among the ancient rocks will ripple beside green parks and winding level roads all of its way to the tall gray city at its mouth. Its banks will not be scarred by quarries as they now are at Mount Taurus nor will they be made hideous by the signboards of outdoor advertising. . . . After three centuries of struggle and waiting, the people say, they will rejoice at last in a valley of happy reality served by a free and mighty river."

There are also many things for which we can be thankful in Mr. Dana's work on the Sacramento, in addition to the satisfying and often exciting way in which he tells the story of this rich valley—from the time when the Spaniards and other early settlers based a grand life on the valley's fertility, through the crude but exuberant times of the gold rush, down to the later days of turning the land itself into gold and making the river the scene of Hollywood versions of "yellow pirates battling over red decks on the Yangtze; steamboats racing on the Mississippi, with boilers near to bursting; a horse (Continued on page 240)

*The recent volumes in "The Rivers of America" series published by Farrar & Rinehart, Inc., and discussed on this page are as follows:

THE HUDSON. By Carl Carmer. 434 pages. Illustrated by Stow Wengenroth. New York. 1939. $2.50.

THE JAMES. By Blair Niles. 359 pages. Illustrated by Edward Shenton. New York. 1939. $2.50.

THE SACRAMENTO: RIVER OF GOLD. By Julian Dana. 294 pages. Illustrated by J. O'H. Cosgrave II. New York. 1939. $2.50.

"SUDDENLY THROUGH THE AIR, OVER THE HEADS OF THE GUESTS, A SMALL FIGURE HURTLED DOWN FROM THE RAFTERS, SEIZED THE ROAST IN ITS ARMS—AND VANISHED."

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The Heart of a Jungle Monkey

By JULIE CLOSSON KENLY
Illustrated by R. Bruce Horsfall

THE especial monkey of this story was born in the jungles of Mindanao, the most southerly of the Philippine Islands. Just a soft-boned, soft-furred, big-eyed baby, so small that she made the journey from Mindanao to Luzon roomily dressed in a soldier's sock.

The family to whom she was finally presented, and who christened her Jaco, consisted of an American Cavalry officer, his wife and their small son; and in time Jaco came to be loved as much as if she had been a real human being instead of a gray-brown monkey with a solemn face and a pair of mournful eyes. Oddly enough monkeys are the only wild animals whose eyes express sorrow in greater proportion than they do fear. Some savage races believe that monkeys were once men who behaved so badly that Nature sent them to the foot of the class again. Perhaps this is what gives them their tragic expression. It would hurt anybody's feelings to come down from wearing spats and a silk hat to hanging by one's tail in a jungle!

There are two traits that all monkeys are supposed to possess, mischievousness and humor. Jaco had neither. In the three years she lived with her American family she did only one or two really naughty things; and as for a sense of humor she was far too sentimental for light joys. Physically, however, she was strong and active, and never ill but once—and that only because she did not yet understand what variety of human messes were intended to be put inside, and what outside, her stomach.

Not long after she was adopted by her army friends they discovered that they had not only taken to their hearts a little monkey girl, but a vast collection of fleas as well. Jaco's silky fur and tender flesh was a heaven on earth for all the Malay fleas within hopping distance; so one day she was anointed with a salve warranted to kill all her inhabitants. She was furious! No man ever felt more disgraced by being tarred and feathered than she appeared to feel when she looked down at her greasy body. At once she set about licking herself as clean as tongue could make her. It must have pleased the fleas, but no one else. For days she hung between life and death—a small, moaning object, pitiful and sometimes unconscious; a martyr to aesthetics, a lesson in the danger of importing a civilization not native to the country. However, she finally recovered, with the result that she exchanged ointment for a daily bath with soap. It was a terrible trial. Jaco loved water, but she drew the line at soap, and all through her bath she wailed complaints and plastered her hands over her eyes and spit and kicked like a naughty child.

Perhaps she realized that depriving a monkey of its fleas is no real kindness; for flea-hunting to a monkey appears to be as much fun as stamp collecting to a boy. Nature may have been aware of this taste for hobbies when she invented fleas, and Jaco must have spent many bored, frustrated hours scanning her gray silk self for the fleas that never materialized.

Personal daintiness we generally consider belongs to beings higher than those navigating jungles by arms and tails; yet Jaco was extremely fastidious. Her mistress made canton-flannel pads, little monkey sheets, as it were, for her bed; and Jaco at once refused to sleep twice on the same pad until it had been washed. It might be spotless as far as human eye could detect, yet Jaco was not to be fooled. Out of her box her bedclothes would come flying, accompanied by remarks in monkey language that sounded very much like swearing. Pedigreed dogs and cats will sleep on anything provided for them, regardless of whether it is soiled or mussed. Not so this wild monkey. If she could not have her linen changed every day she'd know why!

Jaco's chief diet was bananas, but she also loved ginger-ale; and the pop of a bottle would bring her flying, shrieking with delight, to have her own little glass filled with the bubbly wonder; but even more than cakes and ale she loved steak and roast beef—which, of course, she was

seldom given. One of the really mischievous things she ever did had to do with beef; a temptation great enough to overcome either caution or honor, and which resulted in a coup that would have done justice to Robin Hood himself.

One night a dinner party was in progress, given for an Inspector General who was visiting the Islands. There was much formality and a prize roast of beef—which was a prize indeed in that jungle town. Crisp, oozing red juice, a truly delectable sight to homesick American stomachs, it was set down before the carver. Suddenly through the air, over the heads of the guests, a small figure hurtled down from the rafters, seized the roast in its arms—and vanished! A raid so smoothly carried out, so successful, that it is to be hoped the Inspector General was soldier enough to admire it even if he was splattered with flying gravy.

Jaco was extravagantly addicted to bone hairpins; not to eat, but to crack between her sharp, white teeth. When her mistress took a nap Jaco would cuddle up beside her watching her eyelids with breathless interest. As soon as they closed a little brown hand would steal cautiously out towards her mistress' head. If at that moment the blue eyes unexpectedly opened, the monkey hand would be withdrawn in a flash, while its wise old face would assume an expression of perfect unconcern: Hairpins? Who said anything about hairpins?

"... IF ANYONE THINKS IT PLEASANT TO BATHE BEFORE A CRACK SHINING WITH MONKEY EYES, LET HIM TRY IT."

On rare occasions Jaco was allowed to carry out her little manoeuver, and when this happened she was happy as long as there were any pins left, cracking them between her teeth and spitting out the splinters. But all the monkey's amusements were not as easily explained as this. In those old days, in many parts of the Philippines, the houses occupied by the army were often make-shift affairs; and the house in which Jaco's family then lived was native built. For use as a bathroom a closet was set aside in which a tin laundry tub and pitcher did for more sophisticated plumbing. The floors and sides of these houses were full of wide cracks, and the bath closet of this particular house was, to Jaco, what the moving pictures are to us. When any member of the family took a bath Jaco would scuttle up one of the posts on which the house rested, and, applying a bright eye to a crack in the wall, watch with breathless interest the casting off of her family's familiar skin of silk or khaki and sudden appearance in a strange, pale undergarment that had no buttons or hooks to fasten it on. And if any one thinks it pleasant to bathe before a crack shining with monkey eyes, let him try it.

Yet this was not the most embarrassing part of taking a bath in Jaco's house; for she not only clung entranced to her crack, but she generously called to all the passers-by to share the spectacle with her. She shrieked in excitement! She pleaded to every one within ear-shot not to miss it! Baths in that household became a published report. She had discovered a new species.

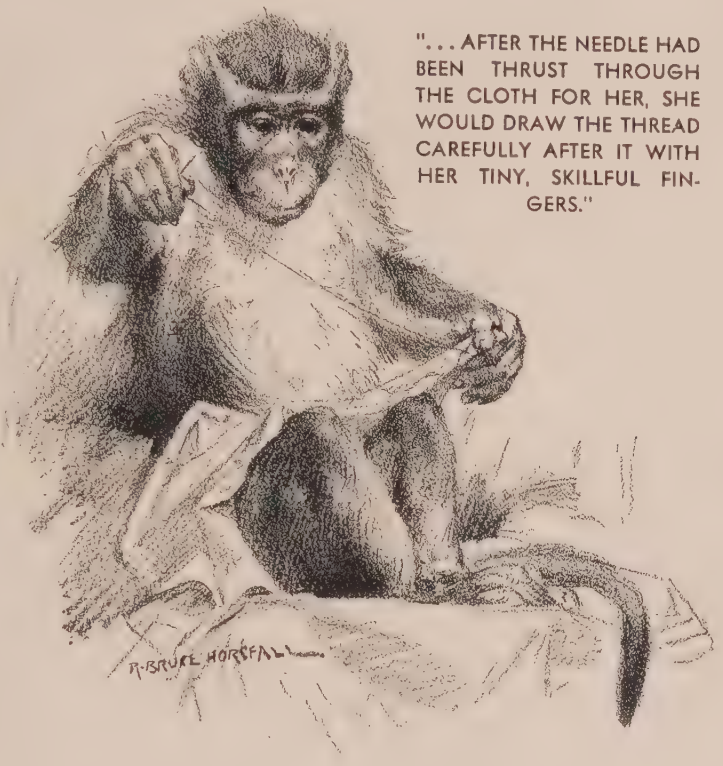
The monkey had early been taught that sewing baskets were things to be respected; and that spools and thimbles were not to tangle about the furniture or roll on the floor. Finally she gained such a property sense, as well as an understanding of usefulness, that she learned—in her monkey way—to sew. She would do this seated on her mistress' lap, when, after the needle had been thrust through the cloth for her, she would draw the thread slowly and carefully after it with her tiny, skillful fingers.

Although the island teemed with her wild relations, Jaco never appeared to realize that she was any kin to them. Or, if in her heart she really did know she was a monkey, it gave her no inferiority complex. Neither was she puffed up with race pride. Only once did she condescend to make friends with one of her kind; and in this case her motive was not of the highest. The doctor at Camp Stotsenburg also possessed a pet monkey who, one day, decided to pay a call on Jaco; which he did, armed as has been many a male before him, with chocolate candy. Jaco graciously accepted the chocolate drop and ate it. Then—like the girl she was—asked for more. So back went the doctor's monkey, returning with another bonbon. This was kept up all the afternoon until Jaco's little stomach was tight as a drum. When the candy was all gone, Jaco gave her friend his

walking papers who, no doubt, "learned about women from her".

I have called this story "The Heart of a Jungle Monkey" because it was really her great power of affection that made this monkey different from our usual conception of jungle creatures. Heretofore the "law of the jungle" has not been understood to include sentimentalists.

Jaco loved the little boy, her constant playmate. She loved her mistress deeply and gratefully. But it was the captain who was her King in Khaki; her god in boots and spurs. We are familiar with the song beginning "There is something about a soldier", and which goes on to explain the age-old charm of brass buttons. It was so with Jaco. She not only adored but she was passionately jealous of the captain. Jealousy is a common enough thing about pets, but the strange part of Jaco's jealousy was that she imagined the captain was equally jealous of her! From her viewpoint he was a perfect Bluebeard. When he was out of the house she lavished her love on his wife and his little boy; but the instant she heard the rattle of his spurs on the verandah her entire manner towards them changed. Indeed, if either of them were tactless enough to attempt to caress her in his presence she turned fiercely hostile. What did they mean by taking such liberties with her? Why did they suppose she wanted her head scratched?



"... AFTER THE NEEDLE HAD BEEN THRUST THROUGH THE CLOTH FOR HER, SHE WOULD DRAW THE THREAD CAREFULLY AFTER IT WITH HER TINY, SKILLFUL FINGERS."

This fear of rousing the captain's jealousy was the explanation of the only vicious thing she did in the entire time they owned her. On this occasion Jaco and the boy had been playing on the floor with some tin soldiers, and Jaco was so busy moving them about that she did not notice the warning jingle of spurs outside the door. The next moment the captain had entered the room and—she was discovered! Discovered playing happily with another fellow! She was terribly frightened, and in a sudden burst of furious repentance she scattered the soldiers in every direction, and springing at the child gave him a deep bite.

Jaco slept in a box put high up under the eaves for better protection, and it was the tall captain who used to lift her into her bedroom at night. But the day she bit his son he decided that he must impress on her that his family came first, and his monkey lady friends must keep their place. Her customary manner of bidding him good night was to take his wrist between her two paws and give it a mighty squeeze. But this night he sternly shook fingers from about his arm. Sternly he told her what he thought of her. Sternly he dumped her in her box and turned away. Jaco was crushed! Several nights passed while he still continued to discipline her in the same manner and Jaco began to pine. At intervals all through the day she would retire to a corner and sit with her hands over her face, her manner of expressing her deepest sorrow. Then, being a philosopher as well as a monkey, one night she made up her mind that all was over between them past any power of hers to change. That was that. She would be as brave as she could with a broken heart in her little gray side. So this night, instead of attempting to catch his wrist despite him, she folded her paws across her breast and gave him one long, tragic look. It was as if she uttered the familiar remarks on such occasions: "Never mind. Soon I'll be gone and not troubling you any more!"

Her mistress, who adored Jaco, was really worried at the condition the poor creature was in, due to her nightly snubbings; so finally she persuaded her husband to let up on this military discipline. It was, undoubtedly, the proper way to handle recruits, but it did not do for monkeys. That night the captain again gave her his hand to squeeze, and Jaco was hysterical with joy. That she really understood what had been going on is suggested by the fact that she never did bite any one again.

But even more extraordinary than her affair with the captain was her behavior with a pig. The house at Niac had originally belonged to a Filipino, who, when he moved out, was allowed to keep there temporarily, until he could build a shelter for them, a sow with a litter of day-old piglets. Jaco was tremendously interested in these domestic animals despite the fact that wild animals did not interest her at all; and she at once selected a piglet she wanted for herself. It was a tiny, curly-tailed bit of pink flesh as amusing in its way as Jaco was in hers. And she loved it. Her mind was forever occupied with her responsibility to give it a higher education. After breakfast she would tuck a griddle-cake under her arm and go to feed her charge; breaking off small bits of cake and handing them to him, while she watched him swallow with an expression of such scientific interest that it might have been a Dr. Dafoe squinting at the quintup-

lets through germ-proof glass.

At any time her piglet greedily seized a bit of griddle-cake which Jaco thought too large for him, she would take his snout between her two paws and, prying it open, extract the food and give it to him again in a more refined manner. And now comes the strange part of the story. Jaco was terribly ashamed of loving a pig! She did love it with all her heart. She hovered over it, caressed it, played with it, fed it, mothered it all the time. But if any human eye discovered her at her devotion she pushed the bewildered pig away with every showing of disgust. She spurned it. She scolded it. She tried to explain it away. Could any of her white friends imagine, she, a monkey lady, would have any traffic with a pig? Could anybody be stupid enough to think she carried off that griddle-cake for any reason but to go on a picnic with herself?

". . . SHE AT ONCE SELECTED A PIGLET SHE WANTED FOR HERSELF . . . AND SHE LOVED IT."

Jaco may not have thought this; but it was what her behavior indicated when she was surprised in such low company.

The family—in fact all of the garrison—used to watch the monkey and her pig; but only when she did not know they were looking. Time and again efforts were made to photograph her feeding her darling, but it could not be done for the mere sight of a camera threw her into a fury. A giggle, a creak of the floor, the least suspicious sound would be all that was necessary to make her dump her pig on the ground and begin gibbering at it in apparent disgust. She was infatuated with it, and thoroughly ashamed of her infatuation. Titania and Bottom with his asses head: Jaco and her pig. The story is old as the heart of man!

As a general rule Jaco had the entire run of the house and the fenceless yard around it; only on the rarest occasion did she wear a belt with a leash attached, yet she never ran away. It would almost seem that she knew when she was well off—a rare virtue even in man. One of the times she had to be tethered was during the Christmas season. All through the exciting and sparkling event of the tree she tugged at her tether and shrilled with anguish because she could not have one of those gay glass balls, with which she would have cut her paws to shreds. There she must sit in sight of all those toys, all that candy, all the brilliant objects twinkling an invitation to her little fingers. To be sure, she had her own toys; but who is satisfied with his own toys? Neither man nor monkey. But when we consider Jaco was only a wild mite, surrounded by innumerable perils and disappointments she could not understand, she had singularly few mishaps, and she managed to keep happy. A better record than we, ourselves, would have made had things been reversed, and it was we who lived in the jungle with Jaco's family.

When the regiment to which Captain Lochridge belonged was ordered back to the states, Jaco could not be taken with them. Quarantine laws prevented; and to the family who loved Jaco as truly as if she had been some dusky human child of their adoption, the grief at losing her cast a shadow even over the joy of going back again to the United States. But it was easy to find a good home for her, as, by that time, she had become a famous lady.

Jaco knew with the mysterious sense common to many animals that some evil happening threatened her, and all through the day that her little crate was being made she followed her mistress, clutching frantically at her skirt, and beseeching with her tragic eyes to know *who was going into that box?* And all through the long ride on the train to her new home some member of the family had to hold her tiny brown paw thrust through the slats of her crate. It was only by tricking her that they were finally able to leave her to her new life.

But hearts heal, even those of a sentimental monkey, and a year or so later Jaco's mistress learned that Jaco was resigned to her new life, and that a monkey friend had been found for her, with the result that she had dropped many of her uncannily human ways and reverted to manners more in keeping with her kind. And one likes to think that, once the break was over, poor Jaco was really happier in a world she understood; a world that did not offer her shining Christmas trees that must not be touched and a King in Khaki who would rather drill a troop of cavalry than to scratch her own devoted little head.

All that is left of Jaco now—for thirty odd years must long since have gathered her to her monkey fathers—is a yellowing envelope shut up in her mistress' Bible. An envelope that contains a lock of dove-brown hair tied with a blue ribbon. It has been preserved by the woman who owned Jaco, and who believes that the little essence of love that was the heart of this jungle monkey will have found a place in the hereafter. And that love can shine in the heart of monkey and man proves that it is a taper Nature has lighted in all flesh for its eventual redemption.

ATHABASKA GLACIER, THE SECOND LARGEST GLACIER OF THE COLUMBIA ICE FIELD

The waters from this ancient mass of ice flow into the historic Athabaska River, thence to the Slave and Mackenzie Rivers, and finally into the Arctic Ocean

The Ice Fields of Jasper

By HOWE CLARKE

FOR THE mountaineer or explorer, fired with the desire of achievement or the widening of general knowledge, the vast and extensive ice fields of Canada's mountains must, for many years to come, offer a strong appeal. During the past decade or more, none of these regions has held a more potent attraction than has the Columbia Ice Field, situated in the very heart of the Canadian Rockies. Within recent years a great deal of exploration work has been carried on in this region, and the details of its general topography have been considerably cleared up. Reputedly the largest body of glacial ice remaining on this continent from the last Ice Age, it strews itself in splendid disarray over an area of approximately 110 square miles of majestic mountain region. From it water pours forth to give life to streams which, choosing three separate pathways, nurture three great rivers—the Athabaska, the Saskatchewan and the Columbia. Each flows to a different ocean—the Arctic, the Atlantic, and the Pacific.

This great sea of snow and ice has an elevation ranging between 9500 and 10,000 feet, or practically 3000 feet above the timber line. It is made up of the accumulations of ice and snow of untold centuries, and represents the climax of snow and ice deposits of the Canadian Rockies. It has been estimated by glacial geologists that during the last Ice Age more than 2000 feet of glacier ice covered what is now the town of Jasper, from which place motorists may now reach the Columbia Ice Field in little more than two hours. Lifted high upon the shoulders of a score of lofty peaks, it sends down glaciers and wildly-broken ice falls to the valleys below, and forms the virtual centre of the water system of about one-quarter of the North American continent.

The largest of the great ice tongues is the Saskatchewan Glacier, which extends for six and one half miles down to the valley, with an approximate width of one mile.

THE ASCENT OF MOUNT ATHABASKA IS A CHALLENGE TO MOUNTAINEER AND EXPLORER

Towering more than eleven thousand feet, this mountain stands guard at the eastern ridge of the Columbia Ice Field, which is enclosed on all sides by great mountain peaks

The Athabaska Glacier is second in area. The first named sends its waters by way of the Saskatchewan River to Lake Winnipeg, thence by the Nelson River to Hudson Bay and the Atlantic. Water from the Athabaska Glacier journeys northward by the historic Athabaska to the Slave and the mighty Mackenzie, losing itself at last, after more than 2000 miles of travel, in the icy flood of the Arctic Ocean. On the west, the east branch of Bush River and Tsar Creek carry some of the ice field's melting waters to the great Columbia River and on to the Pacific Ocean.

In the very centre of the ice field, and practically astride the watershed, rises a curious snow-covered peak that forms the hydrographic centre of the field. It is known as the Snow Dome and has an elevation of 11,340 feet. The entire area is surrounded by some of the noblest and most lofty peaks of the Canadian Rockies. Midway of its northern boundary rises the great gable of Mount Columbia with an altitude of 12,294 feet, the second highest peak of the main range. Mount Bryce (11,507 feet) holds the centre of the southern boundary. Mount Athabaska, more than eleven thousand feet high, stands guard at the eastern ridge. Mount King Edward (11,400 feet) towers to the northwest; while the imposing mass of Mount Saskatchewan, nearly eleven thousand feet high, stands sentinel at the southeastern limit of the field. Thus, bounded on all sides by gigantic peaks, the view from this vast sea of ice and snow is still one of the great mountain panoramas of the world.

In the early part of the Nineteenth Century, many explorers and historians of repute conquered the almost insuperable barrier of the Rocky Mountains, and the names of these first adventurers must ever hold an honored and enduring place. Still earlier, in 1793, Sir Alexander Mackenzie, the daring and indomitable partner of the Northwest Company, fought his way, after incredible hardships, to the Peace and Fraser Rivers, thence overland and down the Bella Coola River to the Pacific Ocean. How vastly different today is the mode of travel over this gigantic range of lofty mountain peaks! Huge transport planes fly over them on clockwork schedules, palatial trains provide daily access to these regions, while a network of hard-surfaced highways enables the motorist to penetrate the wilderness that a few decades ago echoed only the sounds of Nature itself. Through orderly and continuous progress the famous (Continued on page 241)

Often we have been asked—"What are the opportunities in the field of Nature and Conservation?" This is a broad question and not easy to answer, because "Nature and Conservation" comprise a changing and developing field. Then, too, much depends on the individual, his personality, training, and, most important, his enthusiasm. So we turned to one eminently qualified to give an answer—William Gould Vinal, affectionately known to thousands in the field of Nature education as "Cap'n Bill". For many years the leader in Nature work with summer camps; author of *Nature Guiding;* teacher of Nature; and, currently, Director of the Nature Guide School at Massachusetts State College, Amherst, Massachusetts; "Cap'n Bill" gives us the answer here.—EDITOR.

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THE MASSACHUSETTS CONSERVATION TRUCK AND ITS CUSTODIANS
Financed by a group of state organizations, the word of conservation and Nature knowledge is carried throughout the Bay State

Life, Liberty, and the Pursuit of Nature

By WILLIAM GOULD VINAL

WHEN one talks about life, biologically, one means plants and animals. When one talks about liberty, in America, one is talking about freedom of choice. When one says the pursuit of Nature, one means happiness outdoors. If Americans are to continue singing about pristine "rocks and rills," and have it mean anything, we must do something about it. If the enjoyment of Nature by citizens, each according to his individual choice, is again to become a fact, there must be guidance. Guidance to happiness in Nature means experiencing and enjoying rather than memorizing and reciting. Nature guidance is coming into its own as a new profession.

During the last few years, Nature recreation has developed more than a decade in advance of expectations. For example: 142 city parks have varied activities in Nature recreation; 101 cities are maintaining 270 Nature trails. States like Indiana and New York, and cities like Pittsburgh, Cleveland, and Cincinnati, are providing a free Nature guide service for the public. Federal recreation-demonstration projects are converting thousands of acres of submarginal land into great playgrounds and camping areas. Rural land zoning is bringing about wildlife sanctuaries. Thousands of dollars are being spent on city parks. Our outdoor schoolrooms, in the form of parks, playgrounds and organized camps, are here. These forms are distinctly American. They are owned by and for the people. We would not think of constructing million dollar school buildings and omitting the teachers. The expansion of Nature needs is being continuously increased in public parks and similar reservations as a free social service.

Late in May, 1939, Robert Cole, a young naturalist, arrived at the Mount Tom State Reservation from Massachusetts State College. Prior to that he had spent four years in the natural sciences, had taken considerable military science, and had been counseling at a summer camp. He was a recreation major—among the first of that group to graduate. Like thousands of other college graduates he wanted new and challenging work. He found it in guiding park visitors to Goat's Peak; in pointing out how lava welled up from depths to form the Mount Tom-Holyoke Range; in relating yarns at the campfires about the huge pre-historic animals that inhabited the land, air, and water of the Connecticut Valley; and in providing a self-educating Nature trail through the forests. More than 7000 persons attended his campfires; some 4000 profited by guided Nature trips; nearly 1000 children from the rookeries of nearby manufacturing cities attended the day camp. The success of his directed recreation program, the first of its kind on a publicly-owned area in New England, is expected to lead to the adoption of the service in other state forests. The stocking of parks with alert, ambitious young Nature leaders—the kind it pays any community to cultivate—will soon become as much a service as the picnic area, the swimming beach, and the municipal golf course. Today the "frontier," and all it implies, is the American spirit within these public areas.

Last summer, Massachusetts' unique Conservation Truck was manned by two Massachusetts State College students, Frank Kingsbury and William Nutting. These itinerant preachers on the gospel wagon of conservation went at the

job with the ardor of revivalists. The truck was outfitted by the Massachusetts Conservation Council, which is composed of fifteen well-known state organizations including the New England Wild Flower Preservation Society, the New England Federation of Bird Clubs, the Garden Club Federation of Massachusetts, and so on. The truck was a home, a museum and a school on wheels. These Nature pilots visited camps, parks and county fairs. Many other states are actively recognizing that progress in conservation is fundamental. A program in conservation is possible because of the techniques of science. Its success is equally dependent on the knowledge and patriotism of all of the citizens. It is hoped that funds will be forthcoming from some public or private source to make possible other conservation trucks. The leaders to be selected must have the feeling of the national motive and the crusading spirit to carry it out.

Here is another angle. In front of the Indianapolis Children's Museum there is an air of expectancy as a group of boy naturalists assemble in early July. They have been selected, on the basis of fitness, for the Prairie Trek Expedition to the Navajo country. To qualify one must have a "special interest in some department of natural history, such as birds, reptiles, or rocks." Some of their collections go to the museum that commissions them. Among the boys is a tall, lanky leader, "El" Wilson, by name. His background of experience is geology, natural history and travel. These, plus personality, qualify him for the job. Here again we have the spectacle of an expedition by youth serving as a successful antidote to Diamond Dick in Darkest Africa. A pilgrimage to the American Southwest with objectives in geology, archaeology and ethnology is an original idea for a new service. The resourcefulness of the plan is heartening. Such offerings might well be part and parcel, or dunnage and duffle, for young America.

A NATURE LEADER OF TOMORROW

Ruth Hamlin, honor student in biology at Mount Holyoke, examines a sand crab in the collection in the Nature Guide School "wonder house"

Another experiment of the past summer was a government-sponsored camp for Federal employees and their families. The camp was located in the Catoctin Mountains of Maryland. Leslie Clark, a teacher-college student possessed with the commendable idea and courage to prepare for Nature leadership in the elementary grades (which is unusual for a man), was employed as naturalist. Young Clark had had enough of the techniques of outdoor leadership plus native ability to keep families happy on the trail. He was given complete freedom in the development of his program. He recently told me that he never knew who was in his campfire audience. One time a camper asked—"How do they fertilize holly?" Leslie answered it to the best of his ability. A volunteer then arose in the outer circle and modestly asked if he might add a few remarks. Later someone whispered in the "master of ceremonies' " ear that this fellow was the government expert on breeding holly. Fortunately, Leslie had ingrained the first principle of a naturalist, i.e., if you don't know, say so. No one can know everything in science.

It requires great ability to lead families afield. It means that the guide always has a group of various age levels and interests. Each participant is a rugged individual fully aware of the Bill of Rights. Each individual is released to the open and his soul harks back to primitive urges. The human race first experienced direct contact with Nature. Then the idea crept in that Nature, to be worth while, had always to be put in a textbook or in a pickle jar, or desiccated for a paper bag; that it had to be dealt with only in a schoolroom and by a pedagog. We are now getting back to the idea that human life may be enriched in other ways than by the study of the textbook in science. There is no quicker way to bring one to this conclusion than through taking the typical American family Nature-ward.

Now let us turn from the family unit to a collection of families, or the community. Milton Easton of Windsor, Connecticut, as a member of a Boy Scout Troop, had shown unusual interest, plus leadership ability in Nature. Although only a junior in high school, responsible people of Windsor felt that he was the best bet as a community Nature leader for the newly-planned recreation program. Through service clubs it was made possible for Milton to attend an intensive training course in a Nature Guide School. The investment brought good returns in the form of playground Nature leadership. His newly-charged batteries of Nature enthusiasm passed the spirit on to the community by contagion. More than 160 volunteer leaders rallied to the Windsor program of Nature recreation, music and drama, showing what can be done in a community under enthusiastic organization. As further evidence that there is a future in Nature recreation on the

AQUATIC LIFE TWO MILES UP
Member of junior Prairie Trek expedition investigates an alpine pond in Colorado's mountains

playgrounds, the recreation workers of America, at their Congress in Boston, last October, voted to make it their research problem for the coming year.

Another field of new-born Nature service is the Children's Museum. That form of Nature recreation received a great stimulus last year when the first national meeting of Children's Museum workers was called in New York City.

There are other openings in Nature guiding. Some readers may jump at the conclusion that this particular sort of frontier offers an outlet only for men leaders. This is not so. Evelyn Bergstrom is training for the Children's Museum profession. Last September, Virginia Ladd went to the new Youth Hostel School in Meredith, New Hampshire, to take charge of Nature guiding. Her training had led up this particular lane of Nature service and yet how different it is from the opportunities already described. How Nature guiding has taken its place alongside of golf and winter sports at the Northfield Inn might also be added to the list. If the proof is in the pudding, the reader who is willing to be convinced must have already been heartened by the news.

It is evident that things are happening in the field of Nature leadership that are suggesting the future American outdoor program. Obviously, these are only samplings of a vast movement in which Nature guides will be cooperatively engaged. We are dealing with news and not history. One can be in the midst of a renaissance and not know it. No one is wise enough to penetrate the borderland of fifty years hence. However, if the rising thermometer of the interest in American affairs in the open is any indication, we can catch glimpses of opportunities. The cases of Nature leadership already described convey something of the ingenious methods and the spirit back of the movement. The blue-print of outdoor leadership remains to be planned in greater detail.

GEOLOGY, ARCHAEOLOGY AND BIOLOGY INSPIRE THE PRAIRIE TREK EXPEDITION BOYS
Here they have come upon the skull of a bull bison in the South Dakota Badlands, and are "tenderly" excavating it

An equally significant thing in the analysis of the cases described is that all of these students were introduced into Nature leadership through everyday social application. Every one had an innate interest in natural science, but along with it was a willingness to serve others. This attitude is the surest way of understanding the social problems and complexity of human relations of today. Whereas primitive man had to stop, look, listen and act according to the dictates of his natural environment, the modern man has to meet the challenge of the social environment. Although social impacts are intrinsically involved with industrial and economic relations, we are not so far out of the forest that we can get along without ultraviolet rays, fresh air, and release from high tension. Today, it is human beings first and things second. Nature students, as a part of their training, must cooperate in the community in helpful, social work. It will be their function to plan a program of outdoor opportunities for the free choice of all age groups. Socialized natural science, or

YARNS ON THE BEACH
Nature Guide School members get some first-hand information on the ground

Nature recreation, for such a leader offers one of the most romantic jobs of the future. Only the crusader should aspire to the profession.

Nature recreation, moreover, does not mean "technical stuff," as some call it. Future Nature education does not mean inventing gadgets, although gadgets will be used. To communicate with Admiral Byrd in Little America by short wave to the earth's ceiling, or to know immediately and comprehensively that Russia has invaded Finland through the "pretext" of the non-existing threat, is world democracy in the making. Lister's use of antiseptics, Jenner's vaccination for smallpox, and Pasteur's treatment for rabies, are free and essential for civilized man to use. The lay public must be taught to progress. "Pure science" depends on the penetration of the borderland by instruments. The investigator is necessary but so is the interpreter. Today there is a great shortage of people who have the willingness and ability to translate technical science for the layman. The chemist who narrows his horizon to knowing chemistry may do notable work—so may the bacteriologist and all the other specialists. Discovery for mankind must be followed by rationalized use for mankind. Ignorance is the real enemy of the world, and will be until there are coordinators to interpret it all. This sort of opportunity is just as alluring and as enriching as pioneering in the 49's. This guiding is of a different kind. It calls for less brawn and more brain; less blundering and more social engineering; less totalitarianism and more leadership, the latter seeming to be in opposition in a democracy.

A further survey of successful exploits in leadership in Nature recreation brings out the simple but important fact that each student was first prepared through ordinary outdoor life experiences rather than by fact stuffing. Without exception each had had a home Nature influence, had been a member and leader in scouting or an allied organization, and had served in camp or in an equivalent position. Each experience called for a new approach and presented new problems. This growth toward Nature leadership was over a long period of time, each experience becoming fuller and richer. The continuity of such experiences develops an inner philosophy that finally becomes a part of the tradition of the individual. Each individual had Nature impulses for the starting point, and freedom of outward action to carry choices into action according to good old American tradition. Perhaps a chain of practical experiences within the community will form the core curriculum for the future preparation of Nature guides. At any rate, for those who have Nature excitement in the blood, for those who crave new and challenging experiences in the open, here is an antidote for schoolroom anemia. It is a day of quickening hope for the born Nature leader, and the future will hold wider opportunity.

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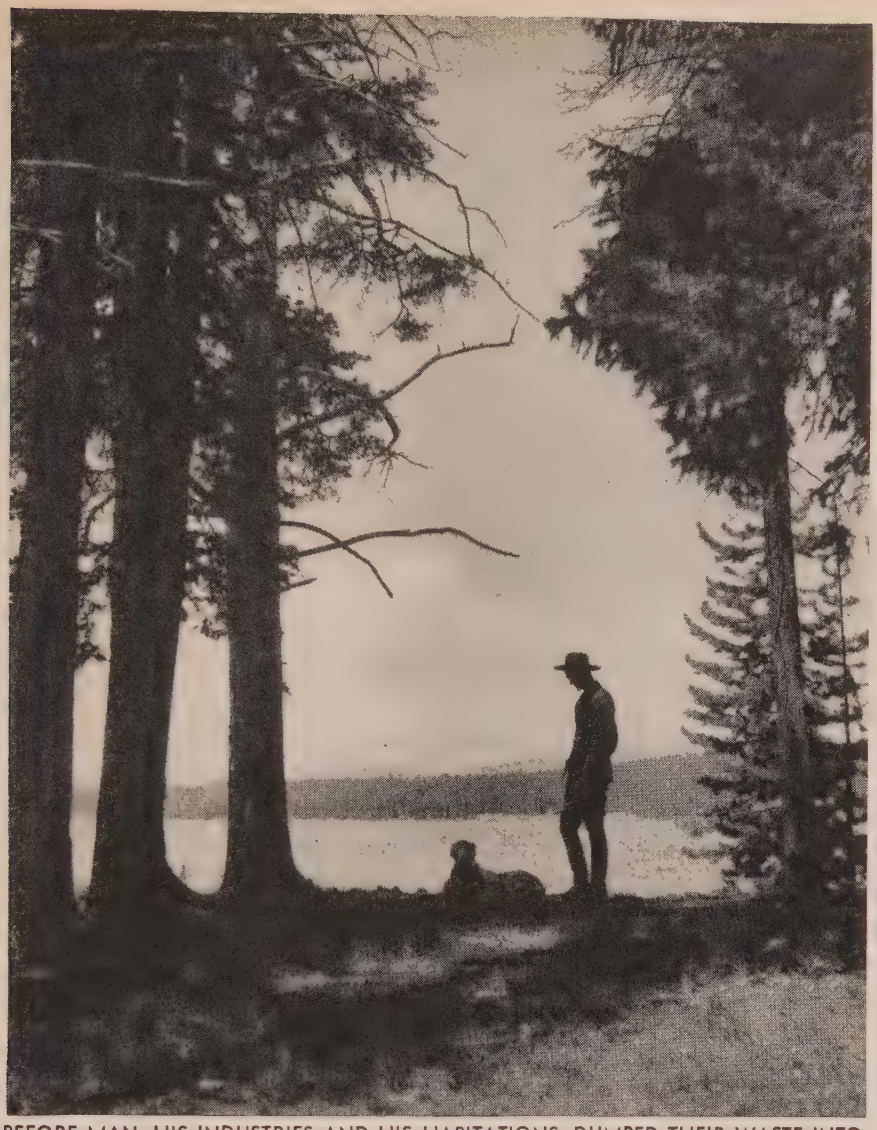
Farewell to Winter Stars

(A Mt. Wilson Idyl)

By WILLIAM COLFAX GRAVES

Till tawny, red-lipped Autumn lures you back,
Farewell, Saiph, Bellatrix, Betelguese,
Three belted Kings, and Rigel, far away,
The brightest of Orion's jeweled suns.
Goodbye, white Dog Star Sirius and red
Aldebaran! The vernal nights are come.
Orion grim, you also take from us
Capella, Procyon, the Gemini,
And the veiled Pleiades and Hyades.
Aye, gone are all these flame-swept Winter friends
That seem cold, twinkling comrades of Earth's frosts
And snows now spent. Sky Hunter, Heaven's splendor,
Diana's darling, you leave us bereft.
But we can court diversion in the glare
Of fiery red Antares's disc and in
The orange tint Arcturus radiates,
While Spica, Deneb and Altair send beams
Of light that pale beside the piercing rays
From blue-white Vega's flashing eyes. Beguiled,
We wait the wheeling of slow Summer skies,
Till, opulent with fruit and corn and wine,
Our tawny, red-lipped Autumn lures you back.



BEFORE MAN, HIS INDUSTRIES AND HIS HABITATIONS, DUMPED THEIR WASTE INTO PURE WATERS, AND UNCONTROLLED FISHING SAPPED THE BROOD STOCK OF OUR FISHES, NATIVE TROUT OF MANY SPECIES ABOUNDED IN THE COLD WATERS OF OUR MOUNTAIN LAKES AND STREAMS

The Story of the Stream

What it was; what it is; and what it can be

By ARTHUR H. FISHER

With 34 illustrations, in halftone and rotogravure, by the Author

WHEN the first white settlers arrived in the New World they found an undisturbed and fully attuned balance of Nature. Every forest, every savanna or open prairie, was supporting its natural numbers of mammals and birds. Each brook, river and lake teemed with fishes, while beneath their rushing or mirrored surfaces countless lesser organisms completed their life cycles with unfailing regularity and furnished food for these finny hordes.

Predators soared aloft, or haunted the forest glades, and down through the centuries the aborigines had become brothers to it all; sharing their hunting grounds with the grizzly, wolf and otter; with the heron, pelican and kingfisher. The smaller fry fulfilled their mission by converting waste vegetable matter into flesh to feed the predators, which in turn weeded out the weak, killing to live and not for sport. Every creature played its part to maintain the balances of power and population.

Deep among damp, moss-covered tangles of the evergreen forests, where mountain streams chanted their joyous way, no rainbow or brook trout had yet felt the sting of the barbed hook disguised as a caddice fly, nor had fought a hopeless struggle against the singing line. Along these same streams, no long-eared, bewhiskered deer mouse,

INTO THE PURE WATER OF MANY WESTERN STREAMS THE FISHERMAN MAY STILL CAST HIS FLY WITH FAIR ASSURANCE OF A TAUT LINE AND SINGING REEL, OF A STRUGGLE WITH A SPECKLED BEAUTY OF THE WHITE, SWIFT FLOOD

peering out from among the hemlock roots, had heard the heavy crunch of the hob-nailed boot, nor the ring of the axe to silence the natural cadences of his woodland home. For centuries their kind had been playing at hide and seek with life and death; with friends and enemies. To the loser death came quickly: by the flash of the otter's rush, the rapier thrust of the heron, the snap of the bloodthirsty shrew, met in a tiny passageway beneath the rhododendron, or the silent downward swoop of the owl on a moonless night. Existence for the lesser folk was precarious, to be sure, but Nature's fecundity could not be denied, and so the game of life persisted.

For two centuries after the landing of the Pilgrims in 1620, little occurred to endanger this harmonious balance, or alter the beat of Nature's metronome. Trout and other fine fishes abounded in nearly all the rivers and brooks, and in most of the ponds and lakes. To be sure, our forefathers, like the Indians, fished the sweet waters to obtain food, yet, consciously or otherwise, they were true conservationists. With few exceptions, they remained so until about 1860, and to some extent during the two decades following. Throughout this period inland fish were never killed for the sake of killing, and allowed to go to waste. For the most part, throughout those long years, our forests remained primeval, allowing the streams to be amply supplied by the annual rainfall, helping to maintain water temperatures suitable for trout. Under these conditions natural propagation continued constant, and both the still and fast waters supported their normal quota of fishes. In certain areas, the adult trout were so numerous that newly-arrived settlers from Europe must have gasped in amazement. Even today, similar conditions still exist in a few western areas—areas that have been saved from deforestation and are now preserved to posterity as National Parks. Such a condition I experienced, with a feeling of wonderment, about three years ago, while traveling off the beaten trails in Yellowstone National Park, on seeing the native cut-throats fighting their way upstream to spawn in countless thousands.

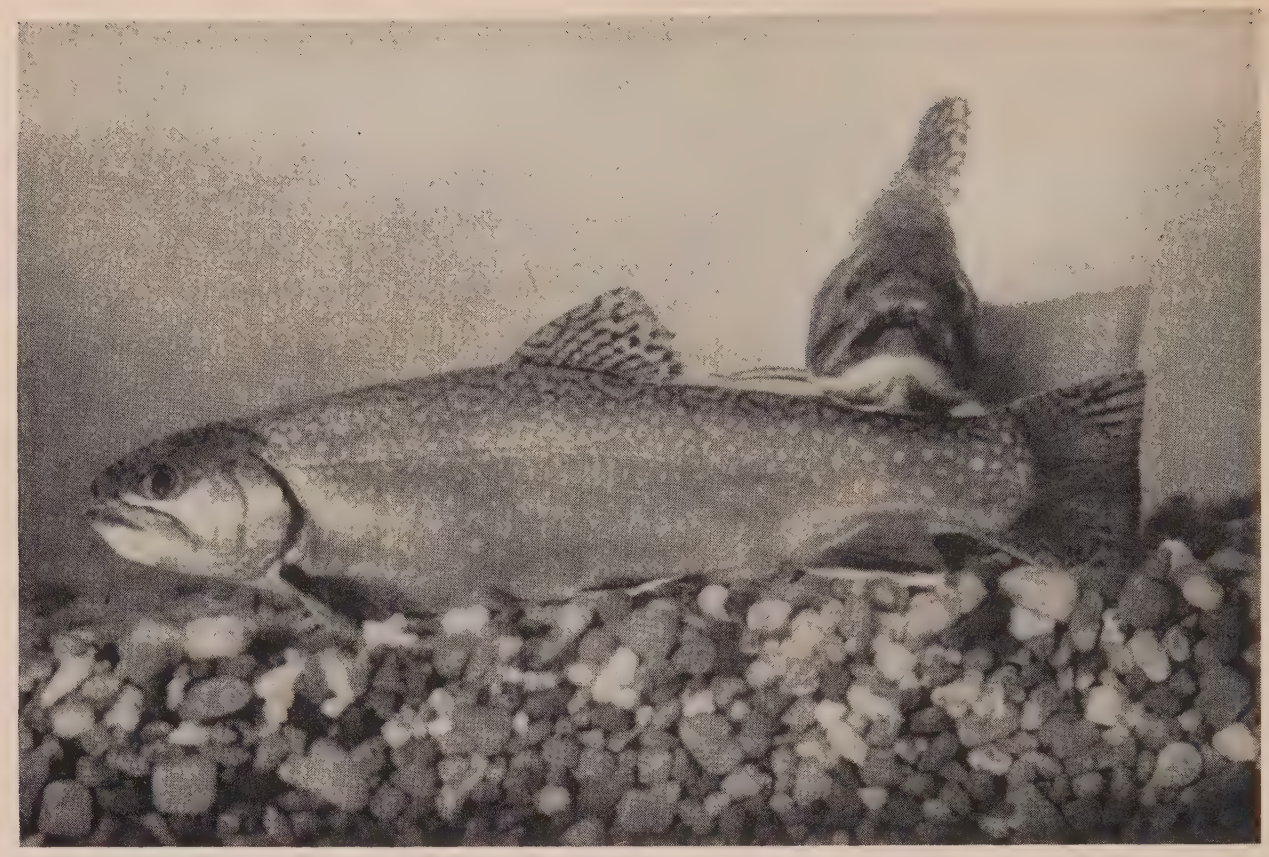
The year 1880 about marks the beginning of the decline of trout in our eastern inland waters; natural propagation had started on the downward curve, and could not keep up with depletion. Deforestation went forward without thought of what might follow in its path. To the lumberjack, trout was something that went into a pan, but behind him came lowered water levels and temperatures. So altered were the habitats and natural environment of many game fishes that their very existence became a struggle, to say nothing of their chance to propagate.

Sawmills on the banks of streams famous for good trout

fishing continued to dump their waste of shavings and sawdust, clogging the pools and the level reaches. Such contamination, together with the silt from the erosion along the banks, rapidly destroyed the organisms upon which the trout depended for food. Coal mines and industrial plants became more numerous, pouring their increased lethal wastes into the waters. Road building follows the water courses, and rock and timber came tumbling into the streams, to join in the well-started despoiling of our natural fine fish population. Our industrial empire was rising, but the rhythm of the cosmic-beat was out of tune for the poor eastern brook trout. With the decrease of water and food, anglers and fishermen were increasing in inverse ratio. Nor, by and large, could one call these fishermen conservationists, of either the conscious or unconscious variety. In far too many cases they grumbled about the scarcity of fish, merrily whipping every available piece of water the while, and killing every trout they could beguile with their lures.

It was during this period that both the national and state governments came to the realization that if our eastern trout were to be saved, restocking by

WHETHER IT BE IN THE RUSHING WATERS OF A WESTERN RIVER OR THE GENTLER-FLOWING COURSE OF AN EASTERN BROOK, FISHING LURES MORE MEN AND WOMEN THAN ANY OTHER ACTIVE SPORT



MALE AND FEMALE BROOK TROUT. REACHING A SELECTED SPOT, THEY FACE THE CURRENT AND THE FEMALE DEPOSITS HER EGGS AND THE ATTENDING MALE FERTILIZES THEM

artificial propagation was imperative. For this purpose hatcheries were built, and soon fry and fingerlings were being planted in great numbers.

For the first ten years, let us say from 1890 to 1900, it was thought that permanent results were being obtained by the planting of hatchery-reared trout. Unfortunately, the men engaged in this work were chiefly interested in the high production of fish. They knew the water temperatures required successfully to maintain trout, and that a given number of brood fish would produce fertile eggs far in excess of the same number of fish in their natural state. Beyond this their knowledge was slight. Applications for eyed eggs, fry, and fingerlings, poured in, and the orders were filled. No systematic planning for their proper distribution existed. Millions of fry were indiscriminately dumped into streams, either to die from lack of food, or to become forage for the larger fish.

Let us pause at this point, and run ahead of our story more than thirty years. Between the years 1932 and 1936, 10,000 eastern brook trout, 120,000 rainbow trout, and 140,000 brown trout, were planted in Squaw Creek in Shasta National Forest, California. As a result of a fact-finding survey conducted by the U. S. Bureau of Fisheries, the records for the 1937 season show a total of 337 catches, consisting of 2504 trout. Of these, 2497 were rainbows, the other seven browns. Not a single eastern brook trout was reported caught.

If situations such as this exist today, it is not hard to see that the work of these early hatchery men was all but wasted. Certainly little or no permanent good came from their efforts. They were a fine group of sincere men—among the first of our early conservationists—but they were toiling in the dark. It was thought that by these methods the trout streams could be brought back to the point where the fish could maintain themselves by natural propagation. In this they failed, and, for want of sufficient biological knowledge and scientific planning, most of their successors have failed. Their dreams have never come to pass, and as far as our eastern trout is concerned they never will. Today, intensive artificial propagation, followed by systematic and scientifically-worked-out plans for stocking, represents the only answer if our fresh water trout in the eastern states are to survive. Hit or miss methods must become a memory. They have been tried and have failed.

Fortunately the dawn of a new era in fish culture and fish management is fast beginning to show above the horizon of past mistakes and experience. So-called practical fish-culturists, who for many years were antagonistic to scientific investigations, are beginning to see the light, and to welcome the assistance of the trained biologist and investigator. On the other hand, the aquiculturist realizes his limitations; that the knowledge of the basic factors involved in the production of fishes and other aquatic organisms is still so limited and fragmentary that it is not possible fully to utilize all the information so far acquired.

For example, not enough is known concerning the life histories of our principal game and forage fishes to state with certainty the species that will do best under a given set of conditions. Furthermore, little is known of the ex-

HUMAN HABITATION FOLLOWS THE WATER COURSES. TO THE BANKS OF RIVERS AND STREAMS COME INDUSTRIES, THAT THEY MAY CHEAPLY DUMP THEIR WASTES INTO THE FLOWING WATERS. IF THE INDUSTRY BE A PULP MILL IT WILL POUR A STEADY STREAM OF POISONOUS "LIQUOR" INTO THE WATERS, KILLING FISHES AND ALL THOSE THINGS UPON WHICH THEY LIVE; MAKING THE WATERS INTO AQUATIC DESERTS. YET IT IS WITHIN THE POWER AND KNOWLEDGE OF THE MILLS' CHEMISTS TO CONVERT THIS WASTE, AND, INDEED, MAKE OF IT A PROFITABLE BY-PRODUCT. YET POLLUTION GOES ON AND INDUSTRY FIGHTS ANY REGULATION THAT WOULD RESTORE STREAMS, SO THAT THEY MIGHT BE HEALTHFUL BOTH TO MAN AND FISHES

tent fish are able to utilize the available food, or how many fish a given body of water can support without their suffering from overcrowding. The loss when planting various sizes of fish is not definitely known. The inter-relationship of various species of fish is still poorly understood. The unknowns are many. As more trained men enter the field these unknowns will become less. Even now today the biologists have sufficient knowledge, which is constantly being augmented by comprehensive surveys, to adopt measures far superior to the haphazard methods formerly employed.

That this new order of things is well on its way to success is evidenced by the results that are being accomplished by the Division of Scientific Inquiry of the U. S. Bureau of Fisheries, and by similar departments being built up within the fish commissions of various states.

Hand in hand with these modern methods, if they are to bear proper fruit, must come a vigorous campaign against those industries and communities that continue to pollute our streams. Study of this question during recent years has proved the vital need for control of pollution, and has developed methods for such control. Polluters, however, have fought off such regulation by resort to political trickery and misrepresentation, and have sought to prevent effective control by pleading the need for further study. Such a viewpoint is represented in the Barkley Bill, now pending before Congress and supported by polluters as a sort of back-fire against laws that would force them to clean up the situation. An effective law is represented by the Mundt Bill, which is supported by conservationists. However, pollution is more than a matter of fish or other aquatic life—it vitally concerns the health of the nation.

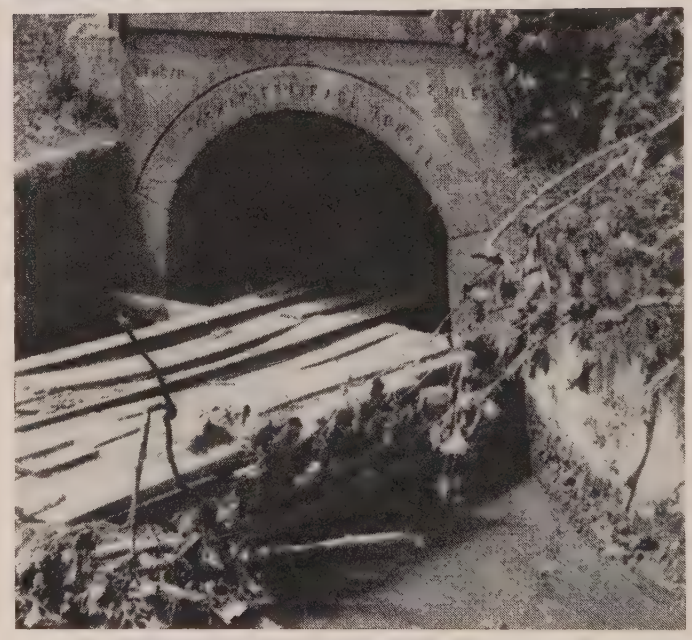
At this point it should be interesting briefly to explain how a scientific survey is carried through before the stocking or restocking of a stream is attempted. Of course there must be a preliminary survey to prove that the stream is suitable in its general physical characteristics. Then water analyses are made and temperatures are taken at various points along its course. If these prove satisfactory, food supply is the next consideration. How many fish will the stream support? These findings are based upon a careful census of the organisms existing over given areas along the stream's course. Special attention is paid to the human factor, such as heavy fishing, the presence of lawless elements, and the suitability of existing fishing laws. Where such laws are poor, or enforcement methods are lax, it may be inadvisable to attempt any management program until the situation is remedied. When the findings of the complete survey are available,

FROM THE MINE AT THE LEFT COMES A KILLING DUST THAT FLOWS, WATER-BORNE, INTO THE STREAM THROUGH THE TUNNEL; FROM THE SAWMILL, SAWDUST

it becomes possible to recommend the planting of fish that should thrive under these conditions and to rule out unsuitable species.

Stream improvement is being carried out successfully in many localities. Barriers in the form of rock dams, silt-checking dams and other devices are placed along the course of trout streams, thus creating new refuges and better conditions for natural spawning. Such improvements come as the result of carefully-planned surveys that disclose both drawbacks and possibilities, and frequently save thousands of dollars that might be wasted in futile planting attempts.

As an example we may well study the results of carefully-conducted surveys to determine the survival rate of hatchery-reared fingerling trout planted in Furnace Brook, Vermont, where the Bureau of Fisheries has operated a test stream for several years. No rainbows have been planted, but heavy plantings of brook trout have been made every year. Nevertheless, the catch of brook trout has shown a decrease each year, while the decrease in the catch of rainbows has been slight.



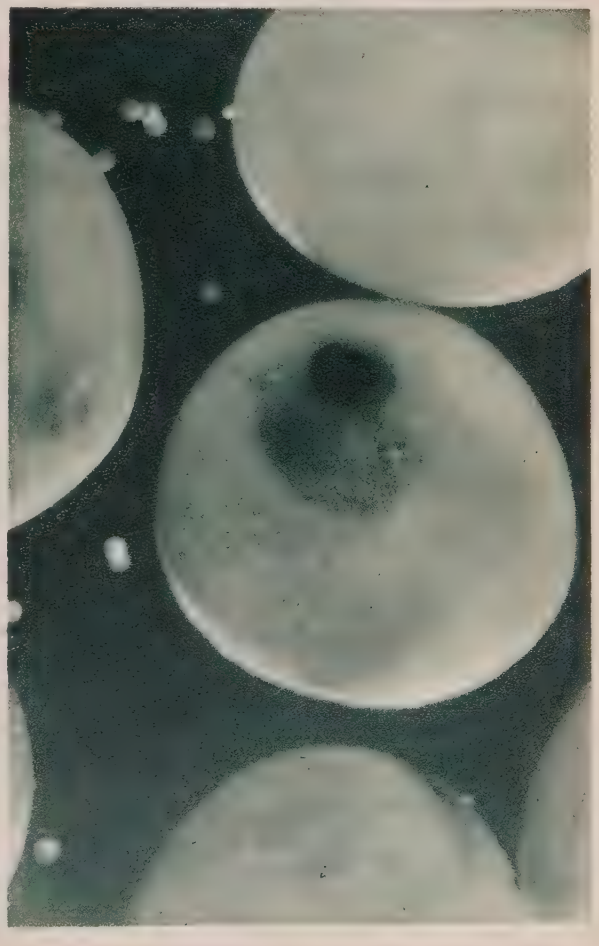
With the cooperation of the Forest Service, the Bureau of Fisheries is conducting a series of surveys in the National Forests to determine the value of various planting programs. Four test streams have been set aside by the State of Vermont to be heavily stocked every year. By a system of tagging, the proportion of hatchery fish caught can be carefully checked. Similar work is being carried on in the Pisgah National Forest, in North Carolina, and the George Washington National Forest, in Virginia and West Virginia. In California, an experimental stream is so controlled as to determine effects of both natural and artificial conditions on fish survival.

Modern hatchery methods are being brought to a high point

(Cont'd on page 245)

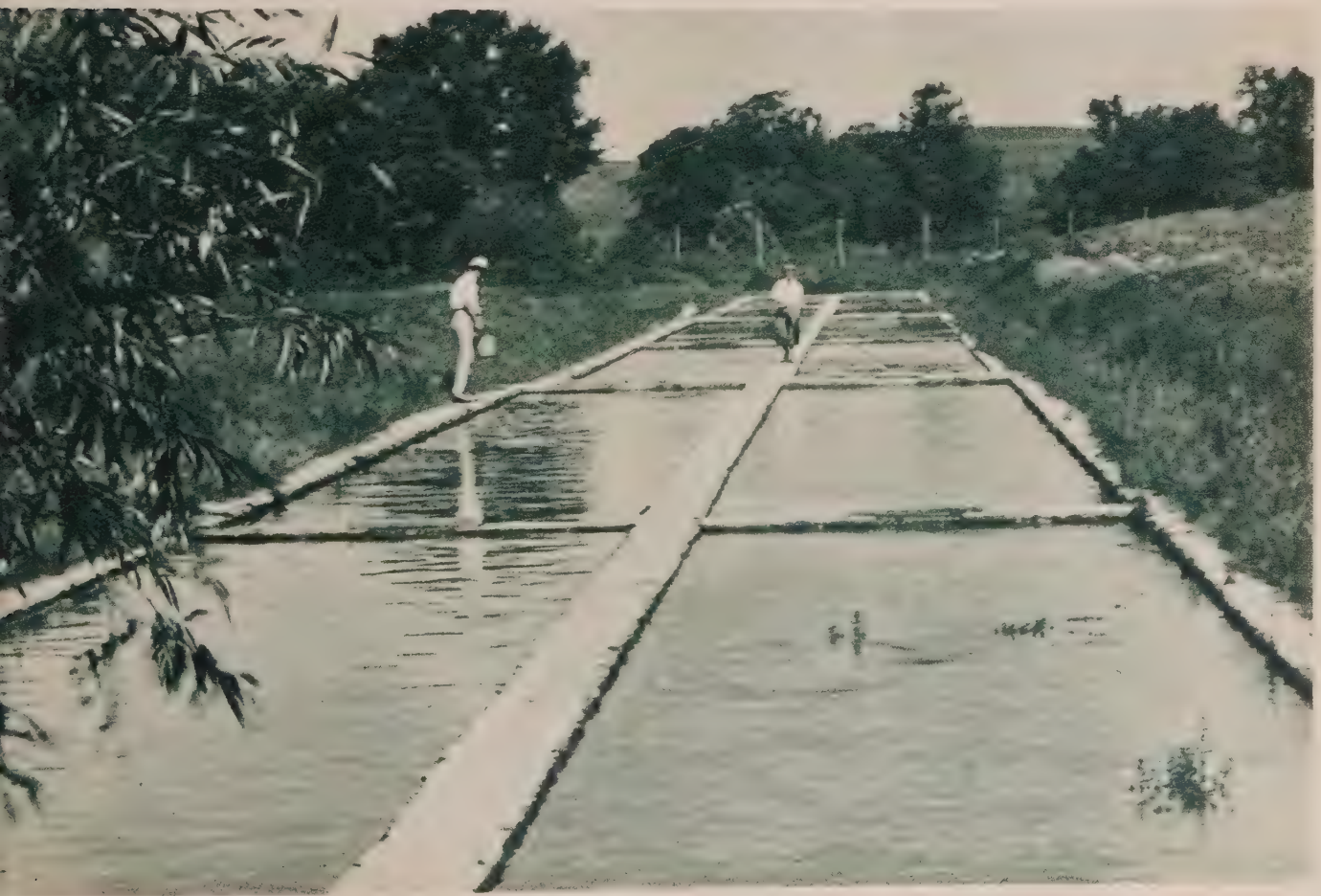
The story of the stream is continued in picture in the Rotogravure Section.

In the swift waters of western mountain streams the beautiful rainbow trout originally lived its life and brought forth more of its kind. Hardy and adaptable, it has been successfully introduced throughout a large part of the United States. Here we see a typical western stream, rainbows in the water, and an "eyed" egg that soon will yield its tiny fry.



Fry just recently from the egg and still with yolk sac, which nourishes the young fish. To support fishes a stream must provide food, such as the nymphs of stone flies and May flies, below, and the hellgrammites and crayfish at the right.

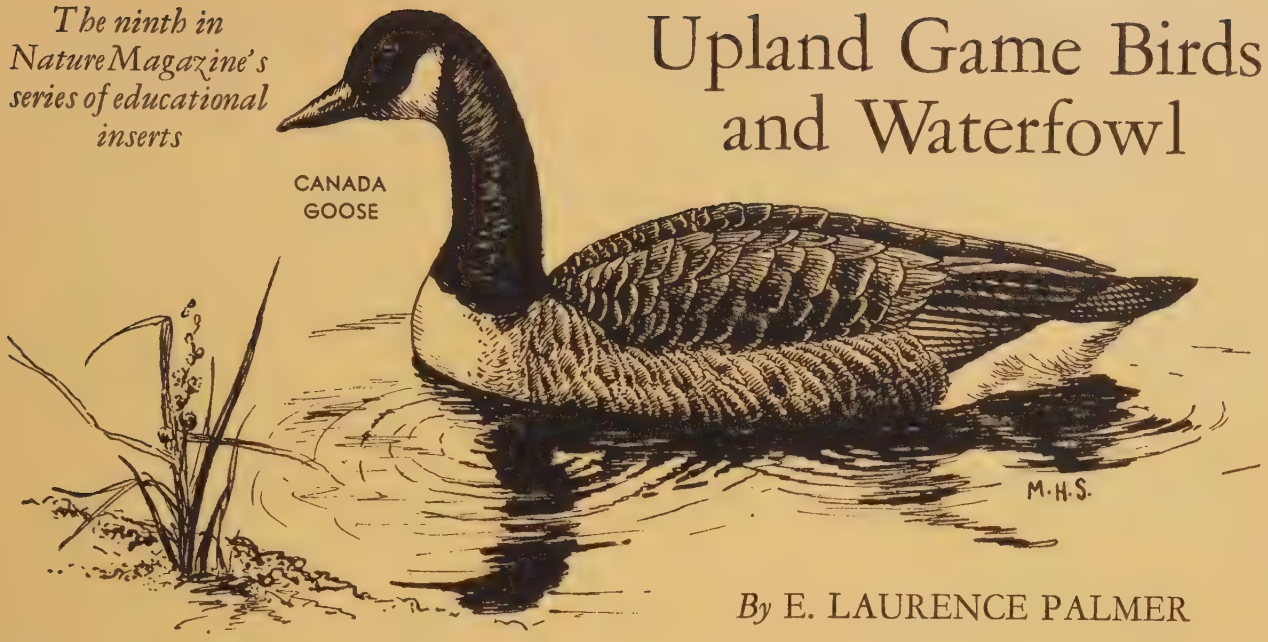
Over-fishing, pollution, destruction of watersheds by deforestation and other man-caused changes, mean that some streams must be re-stocked and restored. Thus man must raise fishes in hatcheries and transfer them, at the proper age and size, to streams that have been determined to afford proper habitat and that promise to supply food and conditions that will allow the fishes to grow to good size and increase in numbers.



In the hatchery the fry produced are brought to fingerling size. There, too, their habits and needs are studied. The modern hatchery has become more than just a place in which to rear fish. With the first appearance of illness among a group of fingerlings, biologists seek the cause and search for means to arrest it. Through the microscope they study diseases, seeing such things as that at the left—the depredations of a dangerous parasitic worm known as *Gyrodactylus*. Thus does science replace the wasteful and hit-or-miss methods of an earlier day. Through selective breeding of the best with the best, better, bigger and hardier fishes are developed, much as the plant breeder produces better, more beautiful and hardier plants for the garden.

The ninth in Nature Magazine's series of educational inserts

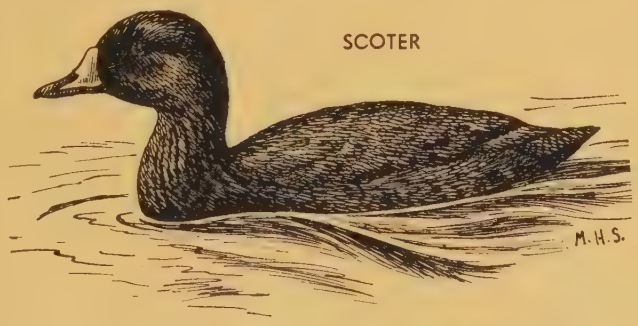
Upland Game Birds and Waterfowl

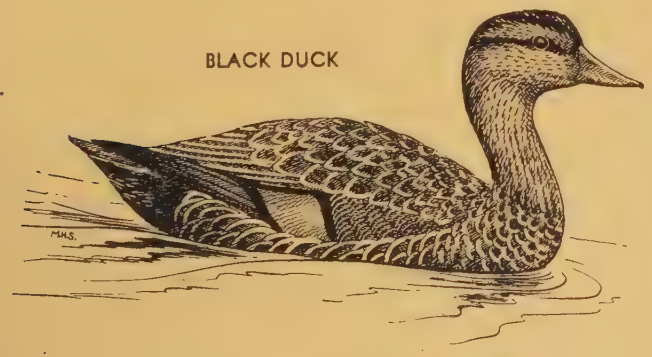


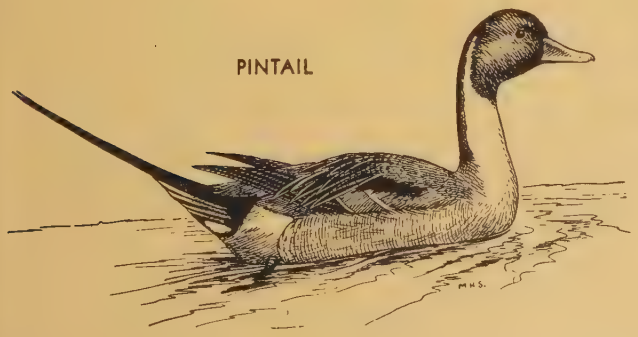
By E. LAURENCE PALMER

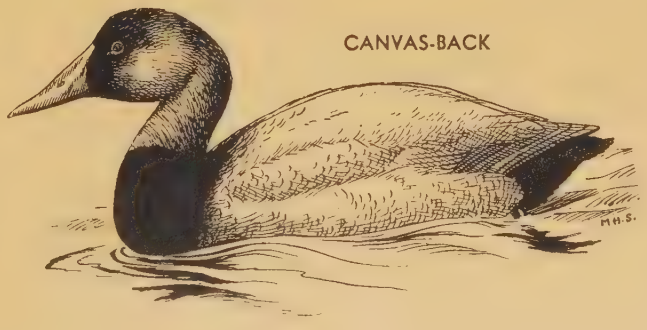
THE GREATEST amount of hunting of birds centers around the pheasants, quail and grouse of the highlands and the ducks and geese of the waterways. In the hectic demand of certain portions of our populations for something to shoot at, we have frequently made over the bird population to suit the shooters. We have even gone to the extent of raising thousands of birds in pens and freeing them only a short time before the date when hunters may legally harvest them.

Where introduced species relieve the native ones from bearing an undue burden of hunting, and do this without interfering with the normal activities of the local species, it may be difficult to find objections to the introduction of alien species, but usually the native species suffer. In the northeastern part of the United States, the fields and woodlands that once supported the turkey, ruffed grouse, and bobwhite quail are now overrun with the mongrel Mongolian pheasant. Grouse, which are susceptible to the diseases of poultry, cannot long thrive where poultry abounds. In the Middle West, the prairie chicken is giving way to the pheasant, and in the plains regions of Canada the Hungarian partridge is estab-









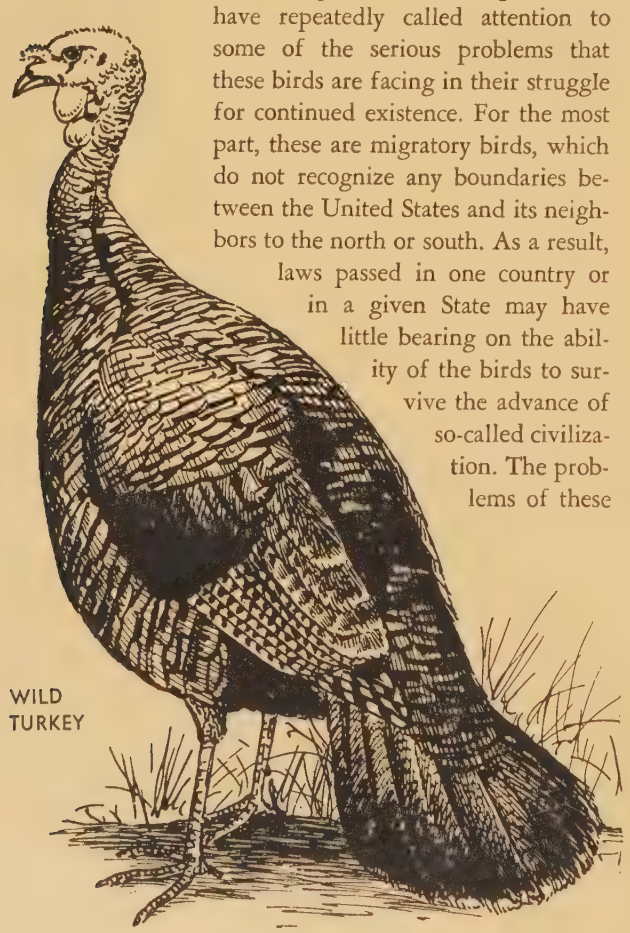
BOBWHITE QUAIL

lishing itself. Given time, our native species are likely to hold as small a part in the game bird fauna as does the Indian in the human population.

Man is intelligent. He can get what he wants in most cases. It seems fitting, then, that one of this series of articles should deal with the problems of our native game birds. If we know that prairie chickens are going out of the picture where pheasants come in, and do nothing about it, we have no complaint to make against others about the result. If Nature educators know this, and fail to bring it to the attention of all, they are not fulfilling their obligations.

Some conception of how the take of introduced birds of the uplands compares with that of other birds may be shown by the 1938 returns from Pennsylvania. In that year, this State yielded 710 tons of ringnecked pheasants, 149 tons of ruffed grouse, 34 tons of wild turkeys, and 20 tons of quail. There were harvested also 27 tons of waterfowl, 9 tons of woodcock and one ton of shore birds, species not indicated.

Next in importance to the land birds in satisfying the lust of man to kill come the true waterfowl, the ducks, geese, and swans. *Nature Magazine* and other periodicals have repeatedly called attention to some of the serious problems that these birds are facing in their struggle for continued existence. For the most part, these are migratory birds, which do not recognize any boundaries between the United States and its neighbors to the north or south. As a result, laws passed in one country or in a given State may have little bearing on the ability of the birds to survive the advance of so-called civilization. The problems of these



WILD TURKEY

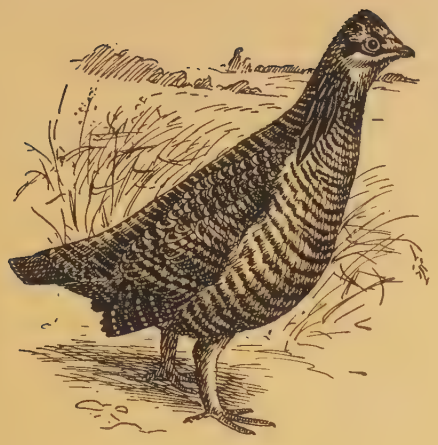
RING-NECKED PHEASANT

birds, as with the upland species, are matters of international agreement and call for true cooperation between all parties.

Early in the present century it was realized that our waterfowl and other migratory game birds were vanishing. Breeding mainly in northern Canada and Alaska, and forced to seek warmer regions in winter, they were fading away under a competitive persecution that was hampered with little restraint, and which asked no questions about the origin of the birds shot, or their future. After several years of study and conference by the conservationists of the United States and Canada, a treaty for their protection between the two countries was ratified. Shooting in the spring, when the birds were already mating, was forbidden, and other restrictions were adopted in the respective acts that gave the treaty force in the two countries. In the United States, the Secretary of Agriculture (now of Interior), through the Biological Survey, which had furnished the data that made the treaty possible, administers the Treaty Act. Canada's officer is the Commissioner of National Parks.

The Biological Survey, after consultation with the States concerned, recommends certain regulations governing the hunting of migratory birds each year. These, if satisfactory, are approved by the Secretary. Of

HUNGARIAN PARTRIDGE



PRAIRIE CHICKEN

course all the states do not think alike as to the amount of protection deserved, and it is never possible to embody in the regulations all the privileges desired. In one important feature, however, all states are treated alike by the treaty, for all are empowered to make and enforce "laws or regulations which shall give further protection to migratory birds". Unfortunately, this privilege is seldom invoked. If a desire for real protection, rather than a striving for killing privileges, were the goal sought by all our states, the birds would be better off.

RUFFED GROUSE

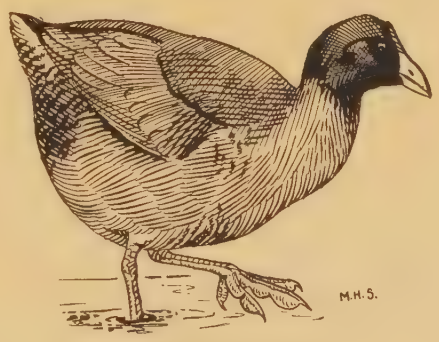
Some idea of the reduction in abundance of some of the waterfowl species may be gained by noting the numbers shot in New York. A survey of the take of ducks in that State shows something like the following for a fifteen year span: *1921,* 180,721; *1924,* 148,771; *1927,* 138,638; *1931,* 55,242; *1935,* 40,578; *1936,* 51,439. The record of take of geese in the same period for New York shows a drop from 3276 in *1921,* to 666 in *1936.*

Records of the take in other states would show larger or smaller numbers during this period, but the proportional decline would probably be about the same. Various interests in different parts of the country are closely tied in with the waterfowl. Some birds that rear their young and get fat on food of the Middle West migrate by way of New England. What section, if any, is entitled to harvest these birds? Can the easterner justly seek to change the open season nationally so that the birds may be shot only when they are in the East, or should the mid-westerner be allowed to harvest all he can get while the getting is good? With the north-south migrants, the majority, of course, the problem is even more complicated. The Canadians get their spring breeding stock from the States, while the States get most of their autumn harvest from birds reared in Canada. The increase is needed by both countries. Who is to say what proportion each section shall get for its contributions? The only answers to these and other problems rest in mutual understanding and cooperation.

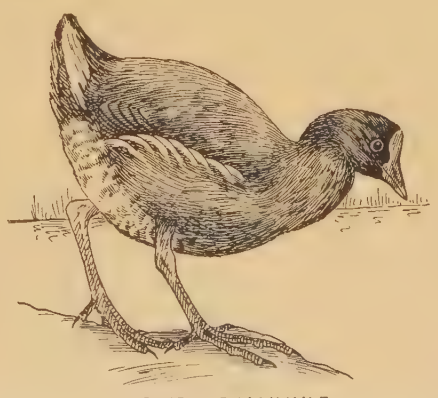
The birds that come from the "haunt of coot and hern" have been almost completely forgotten in the mad scrambles for more game birds in America. Like the ducks and geese, they migrate variously on the continent. They vary greatly in numbers at different times of the year and at different places.

The fates that face some of these birds have been recognized, and the shooting of such species as the yellowlegs and the plovers has been outlawed within the past two decades. In the case of others—the snipe and woodcock—shooting has been continued for reasons not explained, but certainly not biological ones. In New York the take of snipe dropped from 9847 in *1921* almost steadily to 510 in *1936.* Yet shooting of these birds still continues as a legal activity.

For the coots, rails and gallinules an almost ridiculous situation exists. In New York, in *1936,* it was legal for any one of thousands of licensed gunners to take during the season a total of 1350 coots, rails and gallinules, yet the whole state that year produced for all the hunters combined only 1046 of these birds. The take had consistently dropped from a total of 8161 in *1921* to 1046. Lately the number of days of open season has been increased from 30 in *1936,* to 46 in *1939.* The legal daily bag-limit of coots has been raised from 5 to 25, and the legal seasonal take of coots, gallinules and rails has risen from 1350 in *1936* to (Continued on page 220)



AMERICAN COOT



FLORIDA GALLINULE

COMMON NAME SCIENTIFIC NAME	CANADA GOOSE *Branta canadensis*	AMERICAN SCOTER *Oidemia americana*	BLACK DUCK *Anas rubripes*	MALLARD *Anas platyrhynchos*
DESCRIPTION	Length, to 3½ feet. Wing-spread, to 5½ feet. Weight, to 18 pounds, with female smaller than male and young often weighing under 8 pounds and duller in color. Goslings, olive yellow. Bill and feet, black. Call, a high or low-pitched "honk". Fly in great V-shaped formations.	Length, to 21 inches. Wing-spread, to 35 inches. Females, smaller than males. Practically all-black ducks but orange or red at base of bills. The related white-winged scoters are possibly commoner and show conspicuous white patches on wings and smaller white patches around or near eyes.	Length, to 23½ inches. Wing-spread, to 3 feet. Weight, to 3 pounds, 10 ounces, with female to under 3 pounds. Resemble female mallards but lack white borders on blue on wings and with conspicuous white beneath wings when in flight. Males, bill yellowish; females, olive. Males' legs, more orange.	Length, to 28 inches. Wing-spread, to 40 inches. Weight, to 3¾ pounds. Female, smaller than male. Male, breeding and in winter, with green head, white collar, white wing-bars. In flight, shows white tail border. Female, mostly brown but with blue, basal wing-borders, white-bordered.
CLASSIFICATION AND RANGE	Family Anatidae with the swans and ducks. Order Anseriformes. Reported from Pleistocene times from Florida, Oregon and California. Breed northern California to Gulf of St. Lawrence (formerly New England) north to beyond limits of tree-zone. Winter, southern Canada to southern United States.	Like the canvasbacks, diving ducks. Family Anatidae, Order Anseriformes. Related surf scoters known from Pleistocene of California. Breed, Siberia to Newfoundland through northern Canada. Winter, Atlantic coast Newfoundland to Florida; on Pacific, Aleutians to California, Japan and China; occasionally in interior below Great Lakes to Gulf.	Family Anatidae with the geese and swans. Order Anseriformes. Reported from Pleistocene of Florida. Breed, Manitoba to Labrador and south to North Carolina and Colorado. Winter along Atlantic coast of United States and south to Florida, Texas and occasionally California. Extending range westward.	Family Anatidae with the geese and swans. Order Anseriformes. Pleistocene of Oregon and California. Breed, Alaska to Nova Scotia, Iceland, Europe, Asia and Africa, south to lower California, Texas and Virginia. Winter, Alaska to Nova Scotia and south to southern Mexico and Panama.
LIFE HISTORY	Males, ganders, mate with females, geese, for life, breeding when three years old and defend geese while on the nest which is usually on ground but sometimes in trees. Females incubate, 5 to 9, 2¼ by 3½ inch, greenish eggs, 28 to 30 days, from late April to mid July. One annual brood. Adults have one complete annual summer or fall molt losing flight feathers.	By May, arrive breeding grounds. Nest, well concealed in grass on banks with down-lining and 6 to 10, pale yellow, 2½ by 1¾ inch eggs. Incubation, probably 4 weeks. One annual brood. Individuals molt at any time of year. Young, dark brown with white throat. Adults partial molt in spring before mating, complete molt in late summer after rearing period.	Males, drakes, court female ducks by short flights and heads bobbing. Nest, commonly on ground, sometimes in trees, down-lined eggs, 6 to 12, greenish gray, 1½ by 2¾ inches. Incubation, 26 to 28 days, by female. One annual brood. Young, fluffy, yellow, darker above than mallard. Immature young, more striped below than adults. Voice, loud "quack".	Male, drakes, court female ducks by bowing and pursuit but desert when nest is established. Nest usually on ground near water, down-lined, with 5 to 14, 2¼ by 1½ inch, pale green or buff eggs. Incubation, 23 to 29 days. One annual brood. Young, fluffy yellow, with brownish green top and back of head, and sides gray, with brown spots.
FOOD AND ENEMIES	Powerful. Feed largely on roots, grain and other vegetable matter or on insects such as grasshoppers. Eel-grass, a favorite aquatic food. Intelligent in escaping hunters, when wounded lying flat effectively on water or in weeds. Apparently young accept leadership of older birds. Flight speed, highly deceptive, 100 to 120 feet per second.	Food, largely mussels, clams, scallops and similar shellfish taken by diving to depths of 40 feet in sea. May fly inland in long flocks and there feed on fresh-water shellfish when weather at sea is too rough. Excellent swimmers and divers, good fliers but rather helpless when on land. Are generally less suspicious than many other ducks.	Food, ¾ plants, ¼ animal. One-half of plant food is pond-weeds, eel-grass, wild celery, but grain welcome where it is available. Animal food may include crayfish and fishes but these affect value of ducks as food for man. May eat shrimps and mussels useful to man. Among wildest of ducks, not being domesticated easily. Flight speed, 55 to 90 feet per second.	Excellent destroyers of mosquito wrigglers and other aquatic insects but feed on grain when available as do domestic ducks of which they are the progenitors. Better than goldfish as mosquito destroyers. Mate readily with domestic ducks, mingle with other species of ducks freely; may nest in park or other semi-civilized place. Flight speed, 55 to 90 feet per second.
RELATIONS TO MAN	Among commoner and most valuable of wild waterfowl. Formerly more abundant than at present. In early days, supplied much food and filled many feather beds. Rank high in supporting industries dependent on hunting. Numbers have decreased to an unwarranted measure. Take in New York dropped from 3,221 in 1928 to 666 in 1936. Legal bag limit, 4 a day.	Inferior as food because of animal diet but if entrails are quickly removed and birds cooked properly may be edible. Great flocks over shellfish beds may do some damage, related white-winged scoters sometimes using mussels for nearly ¾ entire diet. Difficult to kill and more difficult to get when wounded because of superior diving ability.	Because of wildness can be reared and freed with assurance that birds will provide good sport by wariness. Possibly most valuable food and game ducks of eastern United States. Migration towards seaboard begins in September but birds visit freshwater regularly. Feed commonly at night when disturbed too much. Remarkable hearing.	Probably most valuable ducks in world because of wide distribution, due in part to adaptability. Many are reared and freed to repopulate wild flocks but mallards do not become as shy as black ducks or some other species and so are more easily shot. Along with other species of ducks, mallards have decreased in numbers.

PINTAIL *Dafila acuta*	CANVAS-BACK *Nyroca valisineria*	SORA RAIL *Porzana carolina*	AMERICAN COOT *Fulica americana*	FLORIDA GALLINULE *Gallinula chloropus*
Length, to 30 inches. Wing-spread, to 3 feet. Weight, to 2¾ pounds. Conspicuous field character, long, slender tails, white necks of males and white borders on base of wings and on males across rumps. Females show conspicuous, wedge-shaped tails and white basal wing-borders.	Length, to 2 feet. Wing-spread, to 3 feet. Weight of male, 3 pounds; of female, 2 pounds. Bill, longer than head and continuing profile into narrow wedge. Male head and neck, dark chestnut; body, mostly white. Female head and neck, redder; body, grayer. Blackish rump, both sexes.	Length, to 9¾ inches. Wing-spread, 14½ inches. Weight, to 4 ounces. Females, smaller than males. Sexes similar. Adults, with conspicuous black on faces and throats which is absent in young. Flight, relatively slow, making easy marks for hunters. Back, streaked olive. Breast and sides of head, slate.	Length, to 16 inches. Wing-spread, to 28 inches. Weight, to 22 ounces. General appearance, gray with darker heads, necks and tails. Bills, white. White under tails. Sexes, colored alike. Feet, with webs of toes, wavy margined, but not connected for most of length. Eyes, red.	Length, to 14¾ inches. Wing-spread, to 23 inches. Weight, to 14 ounces. In field, resembles coot but has bill and plate on front of head red instead of white. Sexes, colored alike. White streak appears along side. Tail, black above and white beneath. General color, slate. Toes lack scalloped webs of coot.
Family Anatidae, with the geese and swans. Order Anseriformes. Pleistocene of Oregon. Breed, Arctic Alaska to New Brunswick and south to California and New Jersey but rarely east of Lake Michigan. Winter, Alaska to Massachusetts and south to Panama but uncommon in the east. Related Old World form.	Family Anatidae with swans and ducks. Order Anseriformes. Reported from Pleistocene of Florida and Oregon. Breed, New Mexico to Wisconsin, north to central Alaska and western Manitoba. Winter, southern British Columbia to New York, south to central Mexico and Florida.	Family Rallidae with gallinules and coots. Order Gruiformes. Related Virginia, clapper and king rails known from Pleistocene. Breed, British Columbia to Hudson Bay and south to California and Maryland. Winter, California to Florida and south to Venezuela and Peru. Accidental in England, Greenland.	Family Rallidae, with rails and gallinules. Order Gruiformes. Allied races and closely related species in Europe, Asia, Africa and Australia. Fossil records from Pleistocene of Oregon. Breeds British Columbia to New Brunswick south to Nicaragua. Winter, Alaska to Massachusetts to Costa Rica.	Family Rallidae, with rails and coots. Order Gruiformes. Reported from Pleistocene of Florida. Breeds central California to southern Ontario, south to lower California and Panama. Winter, southern California to South Carolina and south, with closely related species in South America and Eastern Hemisphere.
Drakes mate early with ducks, May to mid July. Nest in grass or sheltered, 5 to 12, greenish buff, 1½ by 2 inch eggs. Incubation, by females, 22 to 23 days. One annual brood. Ducklings, grayer or browner than usual associates, later colored like females though grayer, but take on breeding plumage when about 22 months old. Fall molt of adults, September to November.	Male, drake, mates with the female, duck, after courtship. Nest of weeds surrounded by water, down-lined, with 7 to 15 eggs, olive gray, 1¾ by 2½ inches, often with eggs of redhead and ruddy duck mixed in. Incubation, by females, 28 days. Young, deep yellow, with darker heads, but when immature resemble female. One annual brood beginning May-June.	Commonly nest in marshes but occasionally in grain. Nest, supported by grass stems and concealed by grass. Eggs, 4 to 17, cream to light brown, 1⅓ by 1⅛ inches. Incubation, about 14 days, by females, with probably single annual brood. Nesting May and June. Young, black with orange throat-tufts and bills yellow with red bases. Adults have complete molt, July.	Breed often in colonies, with nests of plants near water. Eggs, 6 to 15, cream-clay colored, 2 by 1¼ inch. Incubation, about 27 days but young hatch at different times, the first being cared for by fathers. Young, black with orange-tipped feathers and black-tipped bills, orange red. Immature, like adults but more olive or lighter in color.	Nest in marsh lands, building more than one nest but occupying but one. Nest, of plant material. Eggs, 8 to 17, buff and spotted 1⅛ by 1½ inches. Incubation, 22 to 25 days. Nesting, late spring. Young, downy black with white-tipped, hair-like feathers at throat; top of head, bare; bill, red but black-tipped. Young, like adults by December.
Food, largely vegetable matter including grain where available but also including aquatic insects, grasshoppers and the like. Can dive and swim readily under water particularly when wounded but is normally surface feeding species. Extraordinarily alert and take to wing suddenly when disturbed, rising steeply immediately. Flight speed, 60 to 100 feet per second.	Food, largely water plants or grain; may even feed on decaying fish, in latter case, are themselves not good food. Young birds develop feathers by 10 weeks. Molts, partial in late July and August, with wing molt in October prior to southern migration. Flocks often fly in V-formation of geese. Winter in "rafts" on lakes. Flight speed, 130 to 160 feet per second.	Food, insects, small crustaceans, seeds and grain, being essentially useful. Southern migrations usually do not begin until frost, so may be irregular even though hunting seasons are not. May cross Gulf of Mexico in southern flight and have been found hundreds of miles at sea. Can swim and dive if necessary for escape or food.	Food, largely vegetable matter such as grasses, water-weeds, roots, seeds and tubers, but also including some small animal forms. Coots are rather unsuspicious, ungainly birds which patter along the water surface when taking to wing and gather in enormous flocks sometimes giving a false impression of their abundance. May hide rather than fly.	Food, plants and animals of habitat, the marsh lands, including grasshoppers and seeds where available. When on water, birds float high and when swimming move head back and forth like chickens. Do not swim as well as coots and prefer to stay more among plants at water's edge. Call, something like clucks of hens but louder.
Among the most beautiful of wild ducks and the earliest to visit the East in spring migration. Desirable as game birds because of alertness, great speed in flight and exceptional food value when taken. Could probably be made to be more abundant.	Possibly the most valuable of game ducks. Flavor of flesh considered superior when birds have fed on wild celery (*Vallisneria*). May survive shore hunting, since are strong divers and swimmers and may feed at a distance from shore in safety but numbers dropped seriously in the East in recent years. Commercial value in East, and consequent scarcity, due to overpraised flavor.	Considered as game birds in spite of size and easy flight. Records of individual hunters in Connecticut show takes of 181 birds in a day. Impossible today for a hunter to get season's limit. New York's records for all hunters show the following: 1921, 2,734; 1924, 222; 1928, 241; and yet there is a 45 day season recently increased from 30 days.	Inferior table birds but relatively easily shot. The legal season's take per hunter might total 1150 although the combined take of all hunters in such states as New York for rails, gallinules and coots in 1936 did not reach this number. Bag limit increased recently from 5 to 25 birds a day. Eggs, edible but inferior.	Considered game birds in spite of relatively small numbers. Examples of takes include Minnesota, 1929, 247; New York, 1921, 551; 1924, 353; 1928, 284. Because of resemblance to more abundant coots could obviously be easily mistaken for them. Do no damage and deserve more protection than they get. It is legal for a hunter to take 450 a season.

COMMON NAME SCIENTIFIC NAME	WILD TURKEY *Meleagris gallopavo*	BOB-WHITE QUAIL *Colinus virginianus*	RING-NECKED PHEASANT *Phasianus colchicus torquatus*	HUNGARIAN PARTRIDGE *Perdix perdix*
DESCRIPTION	Length, to 50 inches; tail, 18½; wings, 21. Weight, to 40 pounds. Differ from domestic turkey in having chestnut instead of white tips to the tail feathers and upper tail coverts. The two birds interbreed freely. Four native sub-species recognized.	Length, to 11 inches but normally 10. Individual wing, to 5 inches. Weight, to 9 ounces, commonly 6. Lower breast, with blackish bars or U-shaped marks. Tail, short. Conspicuous white throat and band across side of head through eye, duller in female. Black on head of male is buff in female.	Length, to 3 feet, half may be tail; female, about 20 inches. Wing, to 10 inches. Weight, to 4½ pounds. Male, with strong spurs, brilliant coloration, white collar and "ear-tufts"; wattles, vary. Females, brownish to chestnut, much less conspicuous in vegetation; both sexes, excellent hiders.	Length, to 14 inches. Individual wing, to 6⅘ inches. Tail, to 3½ inches. Weight, to 15 ounces, the males sometimes being slightly the heavier. Appear in field, intermediate between grouse and bobwhite. Breast, gray, speckled finely with black; in young, with buffy brown.
CLASSIFICATION AND RANGE	Family Meleagridae. Order Galliformes. Fossil species from Pleistocene of Pennsylvania, Tennessee, Arkansas and Florida. Related species from Colorado Oligocene, California Pleistocene. Modern turkey, Texas and Oklahoma, east through Pennsylvania and Florida with Merriam's to southwest. Formerly wider range.	Family Perdicidae, with partridges. Order Galliformes. Reported from Pleistocene of Florida and Tennessee. Range of four sub-species covers most of United States. Resident. Eastern form from Dakota through southern Ontario and south to northern Florida and eastern Colorado but generally mixed with other races; introduced widely; mixed with Mexican forms.	Family Phasianidae. Order Galliformes. Related species reported from Oligocene of Oregon and Miocene of Nebraska. Native of eastern China from Canton to the Yangtse. Four races introduced, mingled and established particularly in grain and corn areas of the United States, England and other parts of the world.	Family Perdicidae, the quails and partridges. Order Galliformes. The partridge of Sweden, the British Isles, France, Switzerland and the Pyrenees with close races in Asia, Spain and Italy. Introduced in North America with variable success, thriving best in Saskatchewan, Alberta and British Columbia and northwest States.
LIFE HISTORY	Males gobble and fight for harem of females but do not help in nesting or rearing activities. Nest on ground, under cover, with 10 to 14, pale buff or speckled brown, 2 by 2¾ inch eggs. Incubation, 28 days. Young need not eat for 2 days after hatching but can run and hide under guidance of the hen though 2 or 3 hens may unite to raise broods.	May keep mates more than one year though cocks fight at beginning of breeding season. Cocks build nests on ground in field, several pairs may use same nest. Eggs, 7 to 28, white, about 1 by 1⅕ inches, incubated by cock or hen 23 to 24 days, average hatch, 86 percent. Young leave nest on hatching; reared by both parents; family together through first winter.	One cock may control a dozen hens, fighting cocks of his own kind and domestic roosters. Nest, in grasses, on ground made by hens. Eggs, 6 to 12, olive buff, 1⅓ by 1¾ inches. Incubation, 26 days, by hens only. Young cared for by females until fall when molt takes place and sex differences are obvious. Adults molt once a year. One brood normally.	Males fight viciously during mating season, do not assist in incubating but help rear young. Nest, hidden on ground by grasses; contains 6 to 18, plain olive eggs. Incubation, 24 days. Young able to run soon after hatching, feeding on small insects. Young molt to adult plumage late fall after being downy, spotted chestnut at first.
FOOD AND ENEMIES	Food, largely seeds, nuts, grain and insects depending on the season and the accessibility of food and cover. Since the birds have to be cautious they are not common ordinarily near habitations, but in early days used to feed with poultry in such places as Albany, New York. Now they are no longer found in New York, New England or southern Canada.	Food, largely injurious insects such as grasshoppers, June beetles, potato beetles, chinch bugs, and squash bugs during summer; dried berries, weed seeds, during winter. Hunters who examine crops of birds killed may hesitate to kill other quail. Winter coveys of less than 10 unlikely to withstand severe cold and wind. Individual range, about 1 square mile. Flight speed, 65 to 85 feet per second.	Food, a variety of plant and animal materials with roughly twice as much vegetable as animal matter through year. Do destroy great numbers of injurious insects as well as corn and other cereals. Crowd out native game birds such as quail and prairie chickens because of aggressive nature and ability. Average population, Middle West, one bird per acre.	Food, estimated 40½ percent insects including 23 percent of harmful species, 50 percent vegetable material other than grain, and only 3½ percent grain; the rest, miscellaneous material. Introduced as game birds rather than as insect enemies. 6,000 planted in Iowa in 1913-14. Flock together in the winter.
RELATIONS TO MAN	Undoubtedly the grandest of America's game birds, which through unwise treatment has been greatly restricted in its range. Attempts to reestablish it as far north as Minnesota have failed. In certain States, such as Texas, where game is "managed" the take in given areas is limited to the surplus and a steady supply is assured, according to reports.	In some states, considered game birds, in others they are song birds. The take of quail in New York State recently was as follows: 1927, 14,170; 1930, 9,013; 1934, 4,064; 1936, 3,112, and yet the crop was reported to be good. In certain states, take is determined by a preliminary survey to guarantee adequate breeding stock. Too useful alive to be killed as game.	Most important game birds; may be reared in captivity and yet become wild on being freed. Minnesota has had annual pheasant kills in excess of a million birds; New York averages around 200,000. Are probably more abundant in America than in lands from which they were introduced. Conservation Departments maintain expensive pheasant farms.	In Europe are shot by thousands by hunters sitting in ease while birds are driven to take wing over obstructions, a practice which somehow does not fit in with American conception of sport or sportsmanship. May become established to supplement quail, prairie chicken and pheasants, but should not be allowed to displace native species.

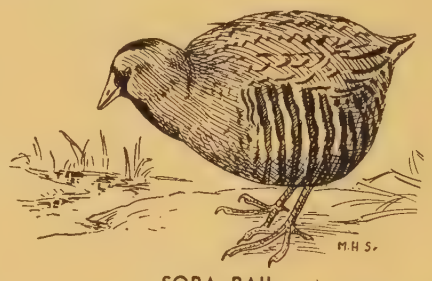
PRAIRIE CHICKEN *Tympanuchus cupido americanus*	RUFFED GROUSE *Bonasa umbellus*	WOODCOCK *Philohela minor*	WILSON'S SNIPE *Capella delicata*	LESSER and GREATER YELLOW-LEGS *Totanus flavipes* and *T. melanoleucus*
Length, to 18½ inches of which 4½ is tail. Individual wings, to 9 inches. Weight, to 2 pounds. Sexes, about equal in weight but cocks with long tufts of feathers on sides of neck back of distensible, orange, yellow area exposed in courtship, also erectable bare spots over eyes in males.	Length, 17 inches with 6¼ inch tail. Finely barred with brown and gray, with outer tail tip, light gray. Ruff on sides of neck, larger in the male. Crest on head. Upper parts of tarsus feathered. Underparts, white with a buff tinge, heavily barred on flanks.	Length, to 1 foot. Wing-spread, to 20 inches. Bills, to 3 inches. Weight, males to 6 ounces; females, to 8 ounces. Whistle in flight and have blunt wings instead of the pointed ones of the Wilson's snipes; also more stocky, and more nocturnal, browner. Fluttering flight.	Length, to 11¾ inches. Wing-spread, to 20 inches. Weight, to 5 ounces. Sexes, alike. Extremely long bills, streaked plumage, white bellies, zigzag irregular flight and weak, cracking cry serve to identify. Lighter in color and slimmer than the woodcocks and larger than spotted sandpipers.	Length of lesser, 11 inches; of greater, to 15 inches. Wing-spreads, 21½ and 26. Bills, under 2 and over 2 inches. Weights, to 3⅓ ounces and to 10 but generally over 5 ounces. Legs, long and yellow. Females, generally smaller than males but sexes colored alike.
Family Tetraonidae with turkeys, quails and pheasants. Order Galliformes. Two related species from Pleistocene of New Jersey and Oregon. Four American subspecies of which one, the heath hen, has become extinct in 1930. Range, west-central Canada to Ohio, south to Colorado and Kentucky, formerly to Pennsylvania; now extinct east of Indiana.	Family Tetraonidae with turkeys, quails and pheasants. Order Galliformes. Reported from Pleistocene in California, Tennessee, Maryland and Pennsylvania. Resident. Six subspecies, the eastern ranging from Minnesota to Massachusetts, south to Kansas and Georgia; others, through wooded northern United States, Canada, and Alaska.	Family Scolopacidae, with snipes and sandpipers. Order Charadriiformes. Breed, southern Manitoba to southern New Brunswick and south to Colorado, northern Florida and southern Louisiana. Winter southern Missouri to New Jersey and south to Texas and Florida. Occasional in Bermuda, Newfoundland and Montana.	Family Scolopacidae with woodcock and sandpipers. Order Charadriiformes. Breed, Alaska to New Brunswick to southern California and Pennsylvania. Winter, Alaska to Virginia and south to southern Brazil but occasionally as far north as Nova Scotia. Sometimes found in Hawaii, Great Britain and Greenland.	Family Scolopacidae, with woodcocks and sandpipers. Order Charadriiformes. Greater Yellowlegs from Pleistocene of California. Breed (1) Alaska to Newfoundland through central Canada; (2) south into United States. Winter mainly Argentine, Chile and Patagonia but also in southern United States.
Males court many females by booming and strutting but fight other males first. Nest, on ground sheltered by grass with 10 to 14 buff, speckled eggs, 1⅜ by 1¼ inch eggs. Incubation, 23 days, the young in Minnesota hatching about June. Young molt in fall to plumage like the adults which have two molts a year. One annual brood.	Males court females by strutting and drumming by vibrating wings while on a log. One male may mate with a number of females whose nests are hidden from male. Nest, in depression, in leaves, in woodlands, reasonably near opening, with 8 to 14, pale brown eggs. Incubation, 21 to 28 days. One annual brood cared for by mother.	Males court females by high spiral flight producing twittering sounds, followed by strutting. Nest on dry ground near wet ground, a hollow, leaf-lined. Eggs, 3 to 4, variable in color, 1½ by 1⅛ inches. Both sexes incubate, 20 to 21 days and care for one brood a year. Young, downy when hatched, brownish white; may be carried by parent.	Males court by remarkable great, spiral flight with "winnowing" sound commonly at dusk. Nests on or near ground of grass, not elaborate, with 3 to 4, greenish brown, spotted or blotched, 1½ by 1⅒ inch eggs. Incubation, about 20 days. One annual brood. Young, yellow, darker above, with dark line eye to bill. Young, like adults by fall; mature year later.	Males court by calling and flying. Nest, hollow on ground. Eggs, 4, pear-shaped, variable blotched or plain, 1⅜ by 1⅛ inches, incubated chiefly by females; probably one annual brood. Young, similar to adults but generally darker and showing little conspicuous seasonal change. Flock in fall, being then more common in East than in spring migration.
Food, animal matter such as insects, 14 percent; 86 percent vegetable matter such as grain, fruits, acorns and berries. In the winter, females may flock together and move to southern part of range. Species extended its range with the cultivation of grain but has been reduced in range by excessive hunting practices. Flight speed, 65 to 85 feet per second.	Food, largely insects in summer but may eat tree buds, fruit and other vegetable material in winter. Young, not fed by mother. Subject to many diseases of poultry and so until practice of rearing on wire was established could not be reared in captivity. This now seems to be solved, though production is not what might be desired.	Food, principally earthworms but grubs and beetles and other insects may be substituted when worms are not available. After July molt, young are like adult but may not mature until next year. This, coupled with relatively small number of eggs, and tendency of birds to congregate in migration, makes it difficult for them to stand too heavy hunting.	Food, largely insects and other small animals but partly plants. Can hardly be considered injurious. Can dive and swim well using wings under water. Believed sound is produced by vibration of outer tail feathers during downward plunge of courtship flight. Feed by probing deeply in soft, wet soil with long bill. Flight speed, 50 to 70 feet per second.	Food, essentially small water animals, the lesser apparently eating less fish than the greater. Become fat in fall before southern migrations begin. Fall migration among earlier of larger birds moving south. Commonly recognized as gleaners of mudflats, sewer beds and salt marshes but less common on sand beaches. Paired calls easily imitated.
The native game bird of the prairie country, being supplanted in part by the pheasant but worthy of adequate protection because of general good qualities. With persecution, it has taken to woodlands and is now commonly found there. There seems to be a periodic abundance and scarcity similar to that with grouse. Splendid game bird.	Possibly finest native upland game birds left in much of the country and though they lack the size of wild turkeys yet they supply superior sport and excellent flesh. Where undisturbed may appear dumb but where hunted are exceptionally shy. Suggested peak population every 10½ years. Average brood range, 40 acres. Broods remain together into winter.	Considered superior game birds because of flesh but really seem too small to be sought too much. Take in New York State follows; 1921, 23,870; 1927, 19,614; 1931, 17,834; 1936, 15,544. Practically wiped out of upper Mississippi valley. Bag limit of 4 a day is too high in view of decreasing numbers and birds should be protected until recovered in numbers. Winter 1939-1940 disastrous in south.	Recognized as game birds because of remarkably confusing flight, flesh being good to eat but are really too small to justify birds' being killed. Abundance may be assumed by take in New York; 1921, 9,847; 1924, 4,444; 1927, 1,300; 1931, 1,571; 1936, 510. Fortunately market hunting is now illegal. Bag limit obviously too high or season too long. Danger of extinction not officially recognized.	Formerly considered game birds but now fortunately on the protected list. New York take of the two species may tell story: 1921, 9,733; 1924, 5,211; 1927, 252, and yet one species has survived since Pleistocene. It is hoped that closing chapter may not be written in this century. Long migrations, useful habits, past survivals, justify better protection.

WILSON SNIPE

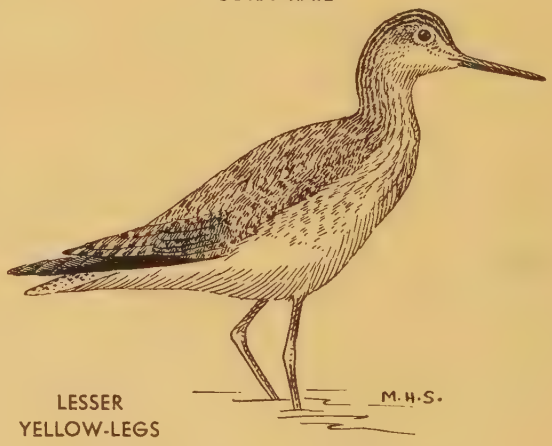
(Continued from page 215) 2,530 in *1939*. We are glad that we do not have to explain all the reasons for these decisions. Is it strange that conservationists wonder where the vanishing point of some of these species may be?

One who thinks of game birds only as gun fodder, who in his mind's eye looks forward to birds exploding in the air into a cloud of feathers at the report of his gun, may wonder why some people who do not shoot are concerned about the birds.

Well, there are those of us who get a real kick out of watching the shore birds—just watching them—and we extend our interests to the other game birds as well. Anyone who has lived for years where the bob-white's call takes the place of an alarm clock; anyone who has photographed the crazy stilts and curlews on the Bear River marshes in Utah, or who has been accompanied on shell collecting trips in Florida or California by sanderlings, coots, or almost any of the ducks, somehow feels that these birds should be as much a part of these environments as the waves and the mud and the sand. In contrast is the Iowa hunter the author knew who once said that he loved quail so well that he watched a covey in the snow fully five minutes before he shot them while they sat.



SORA RAIL



LESSER YELLOW-LEGS

Would that more people had seen young soras around a nest, an avocet trying to lead a foe from its brood, a flock of ibises against a sunset, ducks standing on their heads feeding in shallow water, a mother grouse fighting to protect her young, a willet on a fencepost, a snipe on its nest, woodcock in their courtship act, or the faithfulness of a pair of Canada geese. These are but a few of the things that have entered into the author's experiences which make him feel as he does about these birds. Those who would kill should avoid knowing their prey too intimately. The powder companies who also manufacture films for cameras might profit more by encouraging photography than by promoting killing.

Every community with a body of water should establish a waterfowl sanctuary. Those undertaking such a project will have to face all sorts of opposition and threats, but the end will justify itself, as the writer knows from experience. Tourist bureaus could help this situation by calling attention to the existence of these sanctuaries where visitors may see what they are like, and go home with a determination to duplicate the situation there. State and community outlines in science should list the local sanctuaries, and children should be encouraged to go, to see, and to be conquered.

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ACKNOWLEDGMENTS

This article is based on similar ones by the author published as numbers of the Cornell Rural School Leaflet by the New York State College of Agriculture at Cornell University. Modifications felt to be improvements have been made on the material originally published. Appreciation is expressed to the College for permission to revise and use the material, and to the books that were used to supplement the author's personal experiences. Suggestions for school room activities appear on the School Page. The illustrations, by Hope Sawyer, are new and are copyrighted. The books and pamphlets most commonly used are given elsewhere on this page.

WOODCOCK

When disease is found among the hatchery fishes a disinfecting bath is devised, and the fishes are taken from the hatchery tank, as above, and dunked in this bath. Thus are averted the dangers of carrying the infection into the stream for which the fishes are destined.

Then the fish culturist turns to the stream itself. He seeks to find whether the stream is a proper environment for the gently-reared hatchery fishes. First, of course, the water must be tested on the spot. This must be done both before stocking and before selecting a stream for improvement as a trout stream. Thus a case history of the brook is built up, much as the social worker goes into the background and environment involved in a social problem that confronts her.

The water of the stream having passed the test, a "bottom census" of the organisms in the stream must be made to determine the number of fishes the supply of food will allow. Also it must be proved that proper kinds of food exist. Catches of organisms are made at various points and in sufficient number to give a definite story of the stream's condition and contents. Below is a tray containing the results of the catch from the bottom of the trout stream.

Water and food supply proving equal to the fish culturist's tests, the stream is passed for improvement. Boulders are moved to make better pools. Stream engineers study the course of the brook, picking the spots for changes. Low dams, simulating the natural barriers of the stream, are constructed, making splendid spots for the future fly-caster. The stream ready, the fish must be planted with extreme care. They cannot safely be dumped hit-or-miss any more than the gardener can scatter his seeds with gay abandon. The fishes are coming to a new habitat and merit a proper introduction to it. Thus can man make a trout stream and restore that which he has so often destroyed.

And so, into such happy habitat; supplied with plenty of good food; flowing with pure, cold water; with quiet pools and white ruffed riffles, come the trout. Perhaps they are such as these two cut-throats photographed in Columbine Creek, Wyoming, as they swim up the riffles to spawn.

And from this stream the fisherman may take his lunch, and cook it over a woods fire whose aromatic smoke adds further zest to an appetite already sharply edged by the morning's sport and whetted by the unsurpassed odor of a frying trout.

And thus does the story end, just as with the Indian and the first settlers of this new land—with a meal of trout.

As We See It

A SIX-MONTH SEASON ON ★ WATERFOWL

Some western "conservationists" like it, but it is hard on Ducks and Geese.

Ducks	Nov. 16-Mch. 15	50 poss.
Geese	Nov. 1-Jan. 31	15 poss.
Cranes	Oct. 15-Feb. 28	15 poss.
Mud Hens	Nov. 16-Mch. 15	25 poss.
Quail	Nov. 1-Mch. 31	30 poss.
Wild Turkey	Oct. 1-Feb. 15	2 poss.
Doves	Oct. 1-Mch. 31	15 poss.
White Wing Doves	Sept. 16-Feb. 28	25 poss.
Pigeon	Oct. 1-Mch. 31	25 poss.
Mule Deer	Nov. 15-Dec. 31	1 season
White Tail Deer	Oct. 16-Feb. 15	2 poss.
Wild Hogs	Nov. 1-Apr. 30	4 season

Deer on Cedros Island, protected all year.

Mountain Sheep, Antelope and Egrets, no open season, special permit required.

No, this is not a recital of shooting privileges prevalent a generation ago, before the Migratory Bird Treaty was enacted; before the great drought had forced attention to the threat of virtual extinction that faces several of our waterfowl. Neither is it a product of the period that some style the horse and buggy days. It is merely part of a bulletin, 1939-40, issued by "Mexico International Sportsmen's Association . . . non-profit, non-commercial . . . owned by its members . . . clearing house for American sportsmen who wish to visit Mexico . . . cooperating with the Mexican Government in game-conservation . . . working to simplify the crossing of the border by the hunter . . . entrance fee $25.00. Annual dues $10.00. Annual dues cover all service costs for securing hunting licenses, gun permits, etc."

"All game legally taken in Mexico may be brought into the United States duty free by sportsmen during the open season in Mexico, and for five days immediately thereafter. The game must be declared at the port of entry. Forms are available at the U. S. Customs Offices at the Border. . . .

"Sportsmen's Mexican hunting licenses, with export provisions stamped thereon, serve as customs clearance for game brought out of Mexico. These hunting licenses must be presented by the bona-fide owners to secure the clearance from the U. S. Customs. A copy of the game clearance form signed by the Customs officer at port of entry must be kept with the game as evidence of its import from Mexico.

"During any one hunting trip at weekly intervals each hunter is limited to the U. S. A. entrance of 30 quail, 20 ducks, 8 geese, 15 doves and 2 deer.

"Possession of migratory birds entering U. S. A. must at all times conform with the number and species permitted in the U. S. weekly possession limit."

The addresses of the Mexico International Sportsmen's Association, 1939-40, are given as follows: Home office, Mexicali, Baja California, Mexico. Branch offices are at 1085 North Oxford Ave., Los Angeles, and 1018 9th Ave., San Diego. No names of persons appear on the bulletin, but it carries the parting advice: "Join the Mexico International Sportsmen's Association [in 1938 the Totuava Club] and enjoy that Sportsmen's Paradise, which is Mexico." Addresses for both clubs are identical.

In 1938 the functions of the Mexican International Sportsmen's Association were performed by the Totuava Club of Mexico. This club advertised itself and its aims in precisely the same language that the M. I. S. A. used a year later, and its statements of seasons, bag limits, and the privileges that go with its membership, are couched in language that is almost identical. We learn from reliable sources that both organizations have the same leadership, and, as stated above, the same addresses appear in the 1938 and the 1939-40 bulletins. It is known that the owner of the Totuava Club transgressed the laws of both the United States and Mexico, and lost his club holdings, but plainly not his ambition to profit at the expense of wildlife. Only a few weeks ago his picture appeared in a California newspaper, featuring a hunt recently taken in Mexico.

Judging by items appearing frequently in the newspapers, it has become quite the thing for actors, movie directors, players of baseball and other popular games, persons of political prominence, and others, to visit Mexico in winter to shoot migratory birds and big game. One suspects that many such articles are in the nature of publicity stunts. But the authenticity of these trips is frequently attested by illustrations—and occasionally by court records.

As has been stated on several occasions, the shape of North America is favorable for both the production and

the destruction of waterfowl, being broad at the north where the birds are produced, and narrow at the south, where they must congregate in winter. Topographical conformations also lead to concentrations at that season at low altitudes near the eastern and western coasts. The eastern seaboard from New Jersey to Florida is in a way analogous to California, and hunters of both sections are willing and eager to profit from these natural advantages. Citizens of California have an advantage over the easterners in that they can follow the harassed waterfowl on to Mexico after the flocks have escaped that state's bombardment, and lengthen out their shooting season.

Until recent years relatively little waterfowl shooting has gone on in Mexico, but that condition has changed. Mexico's frank appraisal of its wildlife on a commercial basis, as evidenced in its treaty, permits a shooting season extending to March 15. Thus the spring shooting of waterfowl, one of the prime advantages of the Canadian Treaty, is nullified as far as Mexico is concerned. And it is also sadly evident that some of our own citizenry are willing to follow to that country birds that have already faced the guns of a continent in their journeys through two countries. By the Canadian Treaty waterfowl shooting is restricted to 3½ months; by the Mexican Treaty the bulk of such birds as must fare on to that country have their time of jeopardy increased to six months, and may be shot even when mated for the season's nesting.

We are not mentioning names of persons in this article, but it is very interesting to note that in many cases the same individuals have been prominent in leadership in several successive organizations, self-styled conservational in their objectives, which have flourished in California within the past fifteen years. Some of the activities of these organizations are far from beneficial to the wildlife, the subjects of their solicitude. The one now most in prominence is Ducks Unlimited—but that is another story.

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Things to Think About

One hundred thousand acres is the goal set by Percival P. Baxter, former Governor of Maine, for the area of the Baxter State Park in the Mount Katahdin area. At the present time the park encompasses 74,553 acres, which Mr. Baxter has been gradually acquiring and turning over to the State. As a member of the Maine Legislature, and, later, during his two terms as Governor, Mr. Baxter sought to have the State purchase a substantial area in this region. Failing this, upon his return to private life he set out upon a program of buying the land himself. There is a movement on foot to establish a Mt. Katahdin National Park, which would include the area of the Baxter State Park. The former Governor opposes this on the ground that the region would remain more of a wilderness if left in its present status. In fact, a teapot-tempest seems to have grown up in connection with this question, with both sides sincere in their views, but with repercussions that seem, at a distance at least, picayune. For example, the Baxter State Park Commission has refused to sign a coöperative agreement with the Appalachian Trail Conference although Mt. Katahdin is the Trail's northernmost point. Officers of the Conference have been active in support of a National Park for the Katahdin country. Such bickering sustains us in the conviction that we are right in our suggestion in our editorial on Page 161 of our March issue.

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In accord with the reorganization ideas of Harold L. Ickes, Secretary of the Interior, the Wildlife Division of the National Park Service has been transferred to the United States Bureau of Biological Survey, now in Mr. Ickes' department. The new office will be known as the Section on National Park Wildlife, Division of Wildlife Research, and will work both through the Chief of the Survey and the Director of the National Park Service. Victor H. Cahalane will continue to head this work. Coincident with the transfer, Ira N. Gabrielson and Arno B. Cammerer, heads of the Survey and the Park Service respectively, agreed upon a program of policy which is substantially that which has been in force in the Park Service.

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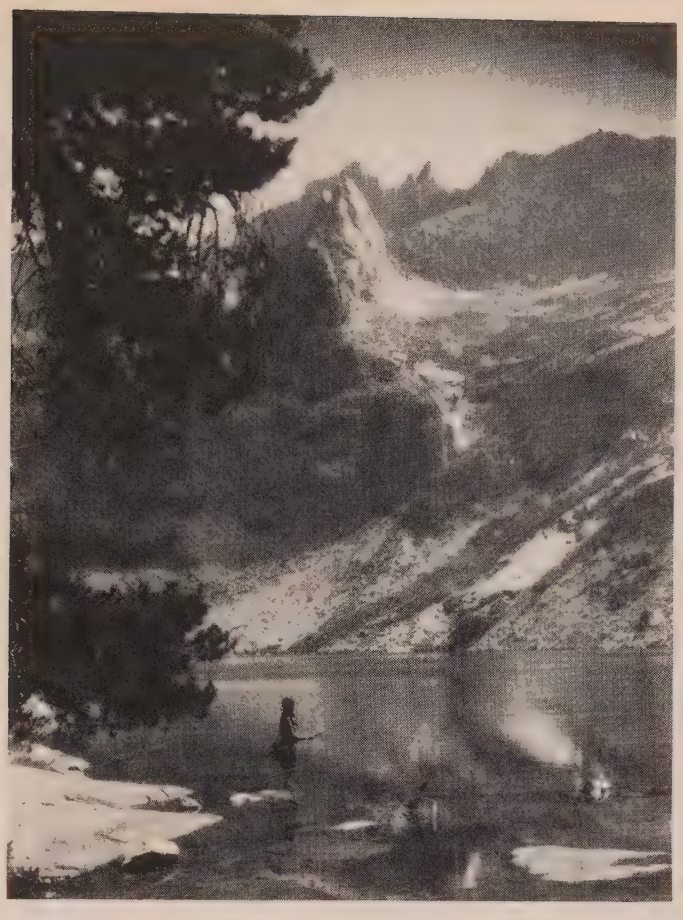
On a number of occasions we have deplored the bounty system as applied to predators and so-called predators, and we are happy to find support for our view in a recent bulletin of the Board of Game Commissioners of the State of Pennsylvania. That state has an outstanding record in wildlife conservation programs and in endeavors to get at the facts of wildlife problems. In two decades, between 1915 and 1935, bounties payments have totalled $2,060,000 for five species of mammals and one hawk. During that period careful records were kept and an analysis of the bounty system has been made. The Board concludes:

"The effects of the operation of the bounty system have been analyzed in detail and it has been shown that as a predator control measure the payment of bounties has proven grossly inefficient, resulting in the control of only one relatively small species population, namely, the wildcat. Also it has been impossible to prove that the operation of the bounty system over a relatively long period of years has improved game conditions. Furthermore, it was shown that the annual amount of money expended for bounty payments was controlled not by the abundance of predators, but principally by climatic and general economic conditions."



FISHING IN A NATIONAL PARK IN A SETTING OF SUPREME RUGGED BEAUTY. THE LADY DEVOTEE OF IZAAK WALTON IS HERE CASTING HER FISH LURE INTO HAMILTON LAKE, ONE OF THE SIERRA LAKES IN SEQUOIA NATIONAL PARK, CALIFORNIA

Top Flight Fishing in the National Parks

By ISABELLE STORY

THE national parks of the United States are the top flight fishing grounds of the country. As public waters elsewhere deteriorate from over-fishing, closeness to industrial areas, pollution, or power development, the protected national park fishing waters attain increasing importance in the Waltonian world.

It is impossible to estimate with any degree of accuracy the number of anglers working park waters each year. The total visitors to all the Federal park areas last year equalled one-eighth the total population of the United States, and thousands of these went to the wilderness national parks, where fishing is the sport par excellence. A ranger count in the Yellowstone, for instance, which entertains nearly half a million persons annually—and mostly in the three summer months—indicates that approximately twenty percent of the visitors there go fishing.

There are many ways of enjoying fishing in the national parks. Some are satisfied to rent tackle and cast from the bank of a nearby stream, during a brief pause in the midst of busy sightseeing. Others, with a little more time, rent both tackle and boats, and go out on such lakes as Yellowstone in Yellowstone National Park, St. Mary Lake in Glacier, Crater Lake in the park of that name, or Lake Mead in the Boulder Dam National Recreational Area. As this is being written, word has just reached the East of a record catch in Lake Mead—a big black-mouthed bass, 24½ inches in length and weighing more than eleven pounds.

While roadside fishing, and angling or trolling from boats on the larger lakes, will always be popular—witness Yellowstone's new Fishing Bridge, with built-in fishing platforms that are always crowded—anglers are displaying an increasing appreciation of the joys of back-country fishing. Rather than compete with the easiest-way fisherman along the accessible streams, a steadily mounting number of piscatorial enthusiasts are seeking the out-of-the-way stream or lake, feeling well repaid for the extra time and effort expended, by the undisturbed grandeur of the scenery and the superior fishing qualities of the water.

Still others go on pack trips—on foot or ahorse—or seek the fishing camps maintained in many of the parks in otherwise isolated areas. The hikers' camps in Yosemite National Park's high back country are perfect for this purpose, and afford inexpensive lodging and meals. Red Eagle Camp, in Glacier National Park, is ideal for the tired business man. Reached only by hiking or horseback, the camp has no radio or telephone, no daily newspaper. The mail comes only when and if a party is coming to the lake—except, of course, emergency messages, which the park rangers always manage to deliver, no matter

PHOTOGRAPH FROM THE SANTA FE RAILWAY

A FISHERMAN CASTS INTO THE FOAMING WATERS OF A STREAM IN YOSEMITE NATIONAL PARK

where the hideout in the rocky fastnesses of the Park.

At such camps, simple cabins cluster around an equally simple dining room, which also serves as a meeting place to discuss the respective merits of this fly or that. The day begins early, with fishing in a mountain-encircled lake. At night the canopy of stars, seeming to roof the lake from the mountain peaks, completes a perfect picture. But in these fishing camps, despite the lure of moon and stars, the day usually ends early, for no true angler will waste the early morning hours in sleep.

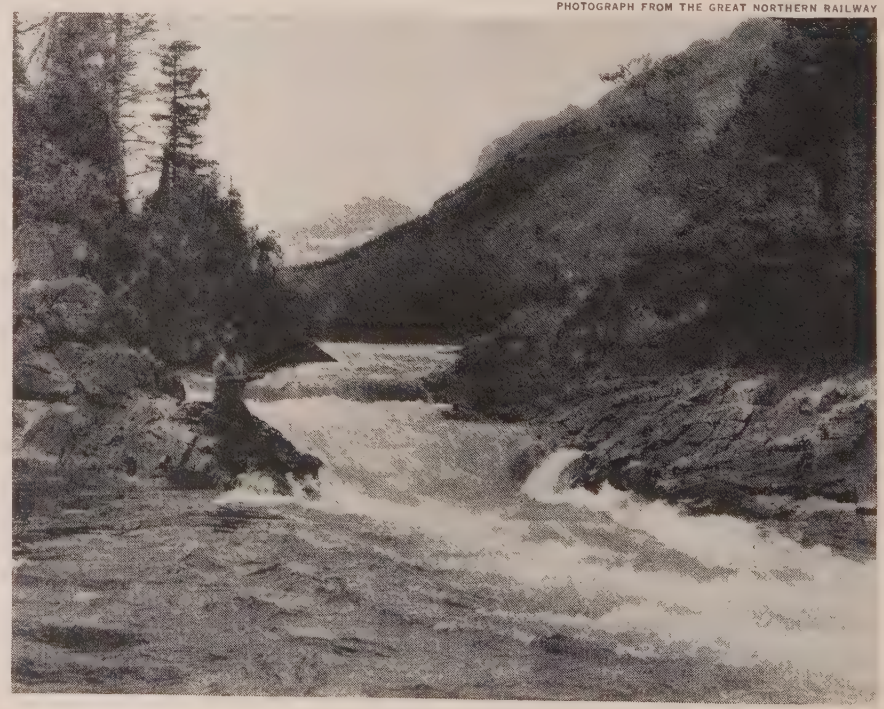
Fishing seasons in the national parks generally conform to the laws of the States in which they are located, as do the rules concerning fishing licenses. The Federal Government requires none, but many of the States in which national parks are located have retained control over fishing licensing, and in such cases State sporting licenses must be obtained by prospective fishermen.

In the great majority of the wilderness parks, the best fishing begins about the middle of June, although the widely separated Yellowstone and Great Smoky Mountains National Parks offer good fishing by June 1, and the California parks sometimes after the middle of May. Earlier than these dates the fishing is not so good, because of high water and resultant muddiness of the streams as the winter snows high in the mountains melt under the smiling spring sun. During the period of high water, such fishing as is done is with bait. But as the high waters subside and the streams become clear, fly fishing comes into its own. Good fishing conditions usually continue well into October.

On May 16, the opening day of the fishing season in the Great Smoky Mountains National Park, the fishermen turn out in full force—the natives say they come in such numbers that they drive away the fish. This, however, is disproved by the catches made. Wander along any of the park's 600 miles of trout stream on that day, and you will see fishermen along the banks, out on rocks in the turbulent stream, or in hip waders. Many of them will have started out at four o'clock, to beat the crowd. Others drive their cars to the end of the road, then walk upstream a few more miles, for complete solitude and priority fishing.

In the Sunrise section, on the eastern side of Mount Rainier National Park, interesting community kitchens have been erected for the fishermen, complete with sinks, scraping boards, and little gas stoves that may be lighted after a coin is placed in the meter to produce the desired flow. These are always in use, campers enjoying them equally with those anglers who have come only for the

PHOTOGRAPH FROM THE GREAT NORTHERN RAILWAY



RED EAGLE LAKE IN GLACIER PARK IS A FISHERMAN'S PARADISE REACHED ONLY BY TRAIL

THE SWIRLING WATERS OF THE GARDINER RIVER, YELLOWSTONE PARK, LURE MANY AN ANGLER

PHOTOGRAPH FROM THE NORTHERN PACIFIC R. R.

day, unequipped for cooking.

In Sequoia National Park there are several streams reserved for the use of children under fifteen. A superintendent with vivid recollections of his own boyhood, and the terrific excitement that followed when he caught and proudly took home a small fish, wanted other boys to have that experience. It is a real pleasure to see the youngsters on the way to their own streams, rods over their shoulders.

To grown-ups and children alike, the novelty of catching fish in Bright Angel Creek, in Grand Canyon National Park, is exciting. One hardly expects fishing streams in this great marvel of the desert country.

In Crater Lake, deep trolling with a copper wire, at a depth of 200 feet, is good fun. Some fish caught there—known from the records concerning stocking to be seven or eight years old—have gained a pound a year in weight since the plant.

Eating mountain trout is one of the *musts* on the schedule of visitors to the Rocky Mountains, and fishermen in Rocky Mountain National Park have the real thrill of catching and cooking their own mess of this flavorsome fish—or of having their catch cooked for them at the chalet or hotel at which they may be staying.

So the fishing goes throughout the wilderness national parks, from the glacier-fed streams of the north to the semi-desert canyon country of Utah and Arizona; from California's Sierra to the Atlantic Coast.

Keeping the waters adequately stocked to meet the exigencies caused by the onslaught of thousands of fishermen each year is a big business. And why not—angling in the United States has grown into a billion dollar industry, with most of the money spent in the vicinity of the popular fishing waters.

So the National Park Service each year, in cooperation with the United States Bureau of Fisheries and State fish hatcheries, plants from twenty to thirty million trout eggs, fry, or fingerlings in park waters.

Approximately thirty to forty million black-spotted trout eggs are collected at the Federal hatchery on Yellowstone Lake, for replanting not only in the Yellowstone and other national parks, but also in areas outside the Federal park system. Indeed, with the serious shortage of trout eggs that has developed throughout the West in recent years, nationwide attention now is focused upon Yellowstone Lake as the major natural source of blackspotted trout eggs. So the national parks bid fair to become fish provider extraordinary to many a Waltonian outside park limits.

The Yellowstone Hatchery is a fascinating place, with its complete display of the fish life of the park. There, in large aquaria,

PHOTOGRAPH FROM THE U. S. DEPT. OF THE INTERIOR

INTO THE FRYING PAN GOES A RAINBOW FROM THOMPSON RIVER, ROCKY MOUNTAIN PARK

swim mature fishes of the various species to be caught in park waters. Of even more interest are the various stages in the fish life cycle. Eggs, newly-stripped from the mother fish, and fertilized, are brought through what might be called the incubator stage in running water under a dark screen. Within the egg the single cell multiplies until the true fish embryo evolves. The rudiments of the eyes can now be seen through the egg shell. It is in this stage that the young fishes can be most easily transported. Sometimes they are stocked in streams, but there is such a high mortality that the "eyed eggs" are placed in troughs in which water is flowing. The young are known as fry. As soon as the yolk is absorbed they take food and grow rapidly. The fry are transferred to large rearing ponds, although they sometimes are released in streams, but there are so many enemies that only a small percentage survives. When the fry have grown to from three to seven inches long, they are placed in large cans, for conveyance to the planting grounds. In transit they must be kept cool and air must be stirred into their water to protect them from suffocation. To avoid their becoming "sea-sick" they are given no food for at least a day prior to the move. The fishes cannot be dumped immediately into the streams when they arrive, but must be acclimated. Each can of fish is set in the stream at the point where the fish are to be stocked. Little by little their water is replaced with water from the stream. In the course of a half hour, when the stream and water in the cans have come to the same temperature, the fish are turned loose to fight for themselves.

In addition to the one at Yellowstone, the United States Bureau of Fisheries operates hatcheries in Grand Teton, Mount Rainier, and Glacier National Parks—a new one being under construction at the latter park. State fishery authorities operate hatcheries in Yosemite and Rocky Mountain National Parks.

The black-spotted trout is the western species having the widest national-park distribution. It is native in Yellowstone, Grand Teton, Glacier, Mount Rainier, Crater Lake, Lassen Volcanic, Yosemite, Sequoia, Rocky Mountain, Olympic, and Zion National Parks. A beautiful hard-fighting fish, of good quality, it is a general favorite among fishermen.

The colorful rainbow trout is another good fighter. Native to the coastal streams of the Pacific Coast, it is good immigrant stock and is more easily produced under artificial methods than any other species of trout. It has been so widely distributed through artificial planting that it may now be taken in most waters from the Pacific to the Atlantic Coasts and from Canada to Missouri, North Carolina, and Tennessee—or wherever water temperatures permit. As a result, it is well established in most of the wilderness national parks, including the Great Smokies. The rainbow is more difficult to take than some other species of trout—a quality that appeals to the sportsman.

The eastern brook trout has reversed the story of the rainbow. Indigenous from the Labrador Peninsula to Georgia, and west to Montana, it is found naturally in Shenandoah, Great Smoky Mountains, and Acadia National Parks. It has been planted and has become thoroughly adapted in many western waters, and is now found in Crater Lake, Glacier, Rocky Mountain, Yellowstone, and Olympic National Parks.

Loch Leven, an importation from Europe, a hard-fighter, is found in certain waters in Yellowstone and Grand Canyon National Parks. With the policy now in force of planting only native species in park streams that already contain fish, this species probably will always be limited.

Steelhead trout, a form of the rainbow native to the Cascades region, may be caught in the Olympic Park.

An unusually beautiful fish is the Montana grayling, a silver and turquoise blue beauty with rainbow-tinted fins. It tastes like trout, strikes faster, and is hard to hook. The grayling is native in Yellowstone waters, and has been planted successfully in Glacier, but it does not lend itself to wide artificial distribution.

Another beautiful trout is the golden, found only in some of the higher streams of California's High Sierra, including waters in Yosemite and Sequoia National Parks.

Only a few rules concerning fishing are enforced in the national parks, and those are designed to insure good fishing to all comers. In order that early fishermen may not over-fish the carefully stocked waters—some painfully stocked, as many a ranger can testify after carrying cans of fry or fingerlings to some out-of-the-way stream—a limit is set on the number of fish that may be caught in one day and the size fish that may be retained. All good sportsmen readily agree to the wisdom of such limitations, if good fishing conditions are to continue to prevail.

In general, the number of fish permitted each person during a single day is ten, although the approved catch varies under special conditions, and is determined by the park superintendent and fishing specialists. To avoid over-fishing, possession of more than two days' catch at any one time is prohibited.

To give the young fish a chance to grow to sporting size, the fishermen are requested (politely if possible, emphatically if necessary) to return to the water all fishes caught less than six inches in length. If inadvertently a fish under the limit is caught, the fisherman is requested to handle it carefully with moist hands and return it to the water unless it is seriously injured. If injured and retained, it is counted among the day's legal allowance—so there is no incentive to catch small fish.

The manner in which the amateur fisherman catches his fish is left to his own sporting instincts, with one exception. The use of live bait in most of the parks is forbidden. By live bait is meant in particular other kinds of fishes, especially minnows, and insects. This is to avoid the danger of introduction of either foreign fishes, or non-native destructive insects, which might upset the natural fish environment and result in the introduction of noxious organisms detrimental to the game species now there, or in damage to the supply of fish food.

While park authorities encourage the more scientific methods of trout fishing, such as the use of dry flies and barbless hooks, there is generally no objection to the use of spinners or other lures, other than live bait.

Native Vines For Garden Use

By VICTOR H. RIES

THE PASSION VINE IS A PLANT OF THE SOUTH

It may, however, be grown considerably north of its usual range if care is taken in selecting a sheltered site, as against the foundation of the house

VINES are Nature's method of draping and softening her efforts, and well they do it. Whether it be a wild grape vine festooning a tree top, or an old stump covered with woodbine, or a fence post with its poison ivy, the same grace and charm is in evidence. So, also, can we use vines in the planting of home grounds, whether they be large or small, urban or rural. Although many prefer some of the more colorful and exotic vines from abroad, we should remember that our native ones have hardiness and vigor that many of the imported ones lack.

The uses of vines are multiple. Probably the first use we think of is to soften and decorate the architectural lines of our homes. But this is a relatively minor use because an ever-growing need for them is found in their ability to screen, to hide, or to cover an old shed, a barn, an unattractive garage, an old stump, a bank, the bare ground beneath trees, or even the tree trunks themselves. All these needs offer excellent reasons for the use of one or more vines. As to ground covers, or grass substitutes, there are many instances where grass is difficult to grow, but where vines will give a luxurious effect. Banks and slopes, if they can be kept in grass, are often difficult to mow, but they can be made beautiful if planted to vines, and will require little care and attention. Nor should we overlook the value of vines in furnishing shade and privacy on porches, arbors and summer houses. Thus most of us will have use for at least half a dozen different kinds of vines.

But you may say that you do not want vines because of the nuisance and bother that go with trellises. Most vines, however, do not necessarily mean trellises, for most species, if given a chance, will climb by themselves. The trumpet vine and the Virginia creeper, or woodbine, climb by root-like holdfasts, clinging alike to stone, brick or wood. It would be foolish to furnish anything for them to climb on. Other vines, such as the grape and the clematis, climb by tendrils, which, like the monkey's tail, twine around any convenient object. Although these vines may be used on a trellis, a few strings of galvanized iron wire are not only adequate but inexpensive and less conspicuous.

Still other vines, such as the moonseed, climb by twining their stems around any convenient support. Here, again, a few wires will prove adequate. And so we find that all the vines, whether they are native or foreign, climb by one of these methods. Although you may wish to use a trellis for its architectural or decorative value, by the time you have painted it every year or so, and cut out the dead wood from the more vigorous vines every year, you will probably wish that you had used your trellis purely as decoration, and let a wire support care for the vines.

The amount of sunlight available has to be taken into consideration as much with vines as with other plants. Bittersweet, virgin's bower, wild grape, woodbine, and smilax are all satisfactory in shade. On the other hand, our native vines are able to withstand the sun, and, in this respect, are far more versatile than many of the non-native types.

Winter protection is no problem in the use of native vines, but along with this hardiness we do have the problem of pruning. Once a vine becomes established and vigorous, the amount of wood produced is almost unbelievable. Unless the old and weak wood is annually thinned out we soon have a veritable jungle. Although pruning may be done any time of the year, it is best during the winter months when the vines are dormant and there is

ALLEGHENY VINE MAY BE USED TO FILL OUT

An interesting biennial, it has wonderfully complex, lavender-blue flowers

less damage to the old growth.

What of our native vines? How can we use them? What are their advantages and disadvantages? The bittersweet, *Celastrus scandens*, is probably outstanding among all of our vines. Who has not gathered its colorful orange and red fruits in the fall, to see them gradually collect more and more dust on the mantle or the piano as the winter months go by? Our native bittersweet, however, is a rather erratic plant. Some are able to produce fruit without the help of another individual; others, apparently, require a second vine to pollinate them; and a few seldom, if ever, produce fruit. Consequently, the wise thing to do when planting this species is to plant four or five of them, so you will be quite sure of having a crop of fruit. Since the bittersweet is extremely vigorous, heavy spring pruning is not only possible but advantageous.

The clematis offers us several interesting native forms, commonest of which is the white, summer-blooming virgin's bower, found growing along roadsides, in the woods, in ditches, and even around the edge of the town dump. Its feathery-white seeds that follow the bloom are even more showy, if anything, than the flowers themselves. Although the foliage is not quite as good as the Japanese clematis, *Clematis virginiana* will be found to give excellent results in shaded locations where summer bloom is desired.

The passion vine, although a native of the South, is apparently able to withstand relatively low temperatures. Dying to the ground as it does in the cooler climates, if planted against the house foundation it can be wintered considerably north of its normal range. Its wonderfully complex lavender-blue flowers are well worth the effort of growing it.

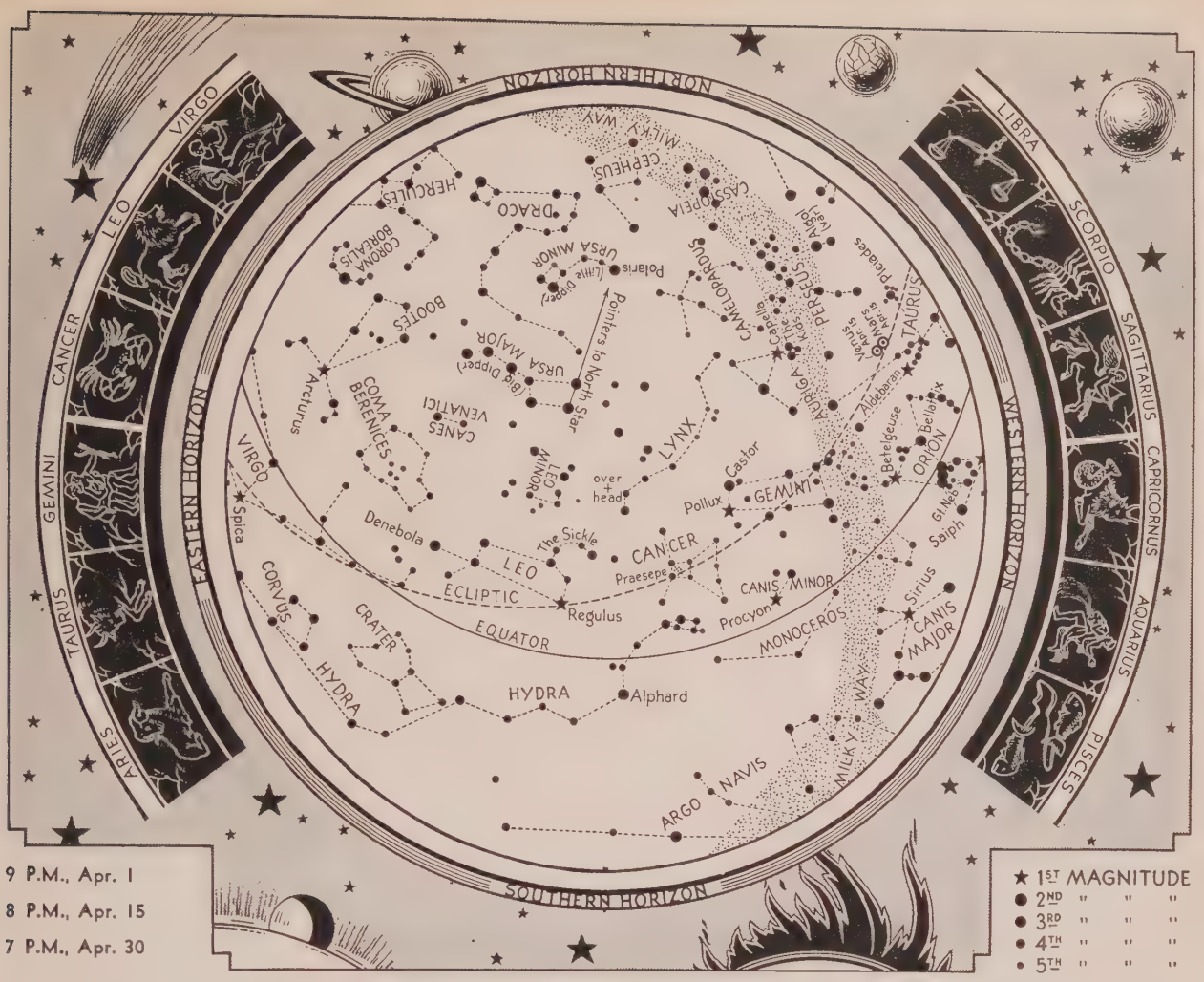
Another vine that is seldom grown, but deserving of wider popularity, is the Allegheny vine, *Adlumia fungosa.* It is sometimes called the climbing fumitory. It is a rather fascinating biennial, the first year forming compact little clusters of foliage not more than eight or ten inches high; the second year becoming a vine and climbing to a height of ten or fifteen feet and producing its myriads of lavender-pink flowers. It is easily grown from seed and seems to be at home in either sun or shade. Being short-lived, it may be mixed in with other vines, such as bittersweet, trumpet vine or woodbine.

Almost everyone must be acquainted with the woodbine, or Virginia creeper, for it seems to grow indiscriminately on fence posts, tree trunks, telephone poles, banks, or even in open fields. Although not as satisfactory for growing on houses as the Boston ivy, because of its tendency to lean out from the house, thereby giving English sparrows a better nesting place, it is delightful when grown as a drapery for telephone or light poles, or on tree trunks. More recently it has been extensively used in connection with roadside beautification programs as a bank plant to cover a lot of the cuts along the highways. Although its foliage is good throughout the season, probably the most glorious stage of its existence is in the early fall when it turns brilliant orange and red.

The wild grapes are probably our most vigorous vines. They should only be used where a large rampant vine is desired, such as for covering a barn, a big shed, a large roadside bank or similar situation. To plant them on small arbors or trellises means a terrific problem of keeping them under control. As with all grapes, summer pruning may be necessary to cut down the tremendous rate of growth.

The trumpet vine needs no introduction to anyone who has been south of the Ohio River. As an easily-grown vine, spreading by underground roots as well as above ground, it must be planted with caution or it will crowd out more desirable plants. It does have its use in more or less wild areas as a fence or pole plant. There is one form, however, the cross vine, *Bignonia capreolata,* found growing along the Ohio River and southward, which is evergreen with brilliant clusters of orange-red flowers. Like the trumpet vine, clinging with root-like holdfasts, it may be used on houses, walls, or tree trunks, as well as on fences and trellises. Although seldom seen in cultivation, it is well worthy of trial where the climate is not too severe.

Scattered throughout various parts of the United States, there are a number of forms of the trumpet honeysuckle, partly shrubs and partly vines, which are occasionally worth cultivating, although unfortunately most of them develop an early crop of plant lice under cultivation. They have one advantage of (Continued on page 241)



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

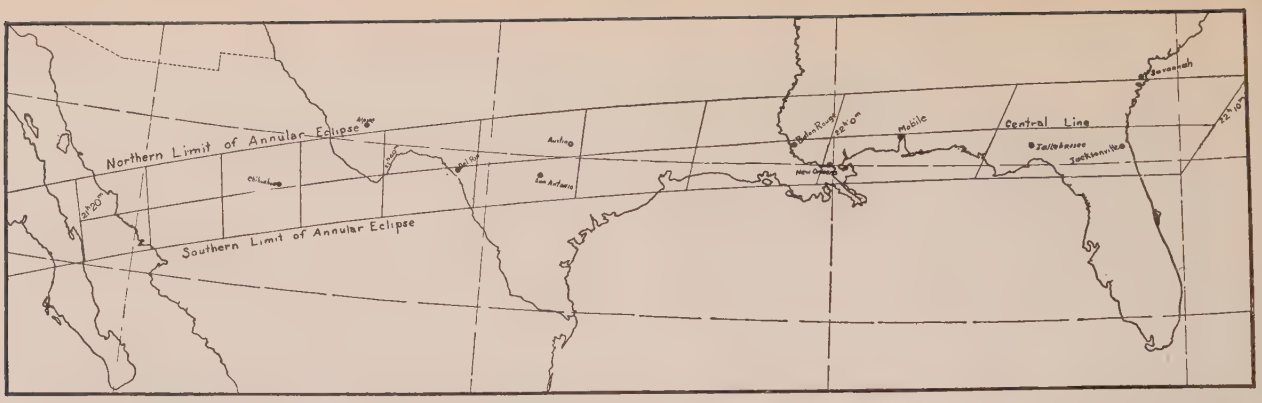
THE APRIL ECLIPSE

By ISABEL M. LEWIS

THE annular eclipse of the sun, which will take place on the seventh of April, will be visible as a partial eclipse in all parts of North America with the exception of Alaska, and in Central America, and the extreme northwestern part of South America. The annular phase of the eclipse will be seen within a narrow strip, approximately one hundred and sixty miles wide, in Mexico and the southern states. A number of cities in the South lie within this belt, including San Antonio, Austin, and Houston in Texas; Baton Rouge and New Orleans in Louisiana; Mobile in Alabama; and Pensacola, Tallahassee and Jacksonville in Florida. Within it, also, are communities from Savannah southward to a point below St. Augustine. If one is so fortunate as to be inside this path the rare phenomenon of an annular eclipse—rare, that is, for any one locality—will be observable for six and one half minutes under the most favorable circumstances.

An annular eclipse gets its name from the fact that the relative distances of the sun, moon and earth are such that the moon cannot completely hide the sun as it passes between it and the earth, and a thin ring, or annulus, of light is seen surrounding the moon at the middle of the eclipse. Outside of the path of the annular phase the magnitude of the partial eclipse decreases with the distance from the path. In the eclipse of April seventh large partial eclipses will be observable in the southern part of the United States and northern Mexico. The town of Chihuahua lies almost exactly in the center of the path, and the eclipse will occur there in the early afternoon, while in Georgia and Florida the annular eclipse will occur after five o'clock in the evening.

The path of the annulus will first touch the earth in mid-Pacific at sunrise, and, after traversing a distance of several thousand miles, passes over Lower California early in the afternoon. It then crosses Mexico and the United States and leaves the earth at sunset a few hundred miles off the coast of Florida. The times of the beginning, middle



THE PATH OF THE ANNULAR PHASE OF THE ECLIPSE OF THE SUN OF APRIL 7, 1940, IN MEXICO AND THE UNITED STATES

and ending of the eclipse and the magnitude of the greatest eclipse are given in The American Ephemeris for 1940 for eighty towns in the United States. At New York the magnitude of the greatest eclipse will be sixty-eight hundredths, and this will occur at 5:05 P.M., Eastern Time. The eclipse will begin there at 3:50 P.M. and will end at 6:12 P.M.

At New Orleans the eclipse will begin at 2:25 P.M. The middle of the eclipse, which will be annular there, will occur at 4:00 P.M. and the eclipse will end at 5:20 P.M., Central Time. The magnitude of the annular phase will be ninety-three hundredths, and at New Orleans it will last for 4.7 minutes. Baton Rouge, which lies in the center of the path, will have an annular phase lasting 6 minutes. The magnitude of an eclipse is given always in parts of the sun's diameter and a magnitude of ninety-three hundredths means that this percentage of the sun's diameter is covered by the moon when the eclipse is at a maximum. At all places where the eclipse will be annular the magnitude will be the same. The ring of light surrounding the moon in the annular phase will have seven per cent of the width of the solar disk, but unless one is exactly in the center of the path the shape of the annulus will not be symmetrical at the middle of the eclipse. The position of the moon's disk seen projected upon that of the sun will change during the annular phase, covering and then uncovering in turn different parts of the solar disk.

Although there is no solar corona visible during an annular eclipse it is a most unusual and interesting phenomenon to observe, and in recent years a new scientific value is attached to the observation of annular, and even partial eclipses, in the study of effect of solar radiation upon what is known as the E region in the ionosphere. So the coming eclipse will have its scientific observers as well as those who will be just interested spectators of an exceptional celestial event. There will also be scientific observers who hope to make some photographic records of the flash spectrum as the moon momentarily shuts off the light from the solar surface, but leaves its atmosphere exposed at the beginning and ending of the annular phase of the eclipse.

There are, in all, four types of solar eclipses. There are those in which the "central line", or track of the axis of the cone of shadow cast by the moon, does not strike the earth's surface at all. These are partial solar eclipses. In such eclipses no total or annular eclipse is visible anywhere on the earth's surface. Then there are the total type in which the apex of the shadow cone reaches to and beyond the earth, and there is a narrow path traced across the surface of the earth by the intersection of the cone of shadow with the earth's sphere. Within this path the moon conceals the sun completely for a few brief moments as its shadow sweeps with tremendous velocity across the earth's surface. In the annular type of eclipse the apex of the shadow-cone falls short of the earth's surface, as it passes the earth from west to east, and the moon can not hide the solar disk completely. There is also the fourth type of eclipse, in which the apex of the shadow-cone grazes the earth's surface at the middle of the eclipse, but falls short of it at the beginning and end of the track across the earth. These eclipses are known as total-annular and they are comparatively few in number. In all four types of solar eclipses there are two shadow-cones, the umbral and the penumbral. If the observer comes within the umbral-shadow cone he will see a total, or an annular eclipse, as the case may be. He will also see a partial solar eclipse before and after that phase, when he will be in the penumbral shadow-cone. If he is in the penumbral shadow-cone only, the eclipse will increase to a maximum magnitude less than total or annular. In the type of eclipse first mentioned only the penumbral shadow-cone touches the earth's surface, so there can be no total or annular phase.

In Oppolzer's *Canon der Finsternisse* are listed all solar eclipses between the years –1207 XI 10 and 2161 XI 17 A.D., also all lunar eclipses between –1206 IV 21 and 2162 X 12 A.D.—in all, 8000 eclipses of the sun, and 5200 of the moon. We find that in the past 100 years, for the earth as a whole, there have been 82 eclipses that were partial only, 69 that were total, 73 that were annular, and 14 that were total-annular. Yet in this past hundred years there have been only *five* annular eclipses that have passed over any part of the United States or Canada. Twelve total solar eclipses have been visible in the United States and Canada during this period, however, some very fine ones, including the eclipse of 1878 VII 29, visible on Pike's Peak, and the eclipse of 1925 1 24, so widely observed in New York and New England. Only one total-annular eclipse was visible in (Continued on page 240)

ELBERTA CLARK WALKER MEMORIAL POEMS

In 1925 Robert Sparks Walker, Tennessee naturalist, writer and poet, established the Elberta Clark Walker Memorial Nature Poetry Contest in memory of his wife. The Chattanooga Writers' Club, of which Mr. Walker is a member, assumed the responsibility of conducting the contest, judging the entries and making the awards. The 1939 contest was in charge of Mrs. James A. Burrow, who enlisted the cooperation of Nature Magazine in printing the five prize-winning poems. Readers interested in the 1940 contest should write to Mrs. Cyrus Griffin Martin, 412 E. 2nd St., Chattanooga, sending a three-cent stamp.

First prize in the 1939 contest was awarded to Eric Wilson Barker of San Rafael, California, for his poem, "Morning on the Marshes". Second prize went to Edith Clifton Purdy of Seattle, Washington, for "The Trout Run". Third prize was awarded to Donald Parson of Pinehurst, North Carolina, for "The Natural Bridge"; fourth prize to Cecilia Hennel Hendricks of Bloomington, Indiana, for "Sermons in Stones"; fifth prize to Lucia Clark Markham of Lexington, Kentucky, for "Moods of Summer". An anthology of past prize poems has been published by Mathis, Van Nort, Dallas, Texas, at $2.

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Morning on the Marshes

By ERIC WILSON BARKER

As lithely as the coils that glide
Across the python's green terrain,
As stealthy as a pard that stalks
His prey upon the sombre plain,
Across the gleaming flats the tide
Creeps slowly on the reedy verge,
And softer than all sounds is sedge
In slow surrender to the surge.

The brittle stems of marsh weed
And their roots that turn and twist,
The marsh owl silence-shrouded
In the spectral morning mist,
And sea-slime covered pier-posts,
And the ribs of rotting ships,
In the cold and silent morning
Knew what soft and sucking lips,
What lapping tongues of water
Were approaching from the sea,
Out beyond the fog-hid fen lands
Where the tides had set them free.
And the oozy, brittle weed stems
And the beds of tawny sedge,
And two white herons standing
On the marshes' reedy edge,

And the marsh owl and the bittern,
And the shell-housed things that creep
On the surface of the slimy ooze
Where stagnant waters seep;
And the separate being that imbues
Each weathered pier-post and each spar
Felt the knowledge come upon them
Of that sound across the bar.
And a silence tense with listening
All the marshes seemed to fill,
Silence deeper than the night wind breaks
When all the night is still!
And suddenly the sedges quickened
With the breath of all things free,
And the pier-posts and the spars did feel
The coming of the sea!

As lithely as the coils that glide
Across the python's green terrain,
As stealthy as a pard that stalks
His prey upon the sombre plain,
Across the gleaming flats the tide
Creeps slowly on the reedy verge,
And softer than all sounds is sedge
In slow surrender to the surge.

•

The Trout Run

By EDITH CLIFTON PURDY

Up stream, up stream, where the clear creeks break
in foam to the marge of the mountain lake,
the trout are nosing the reeds aside,
rocking the lilypads as they glide
on to the creek's mouth, head to the tide
up stream, up stream.

On, up the creek through the alder flat,
where the stream-washed roots are a tangled mat—
well know the beasts and the birds of prey,
and the cannibal fish, that, along the way
the trout is leading her mate today
up stream, up stream.

Rose-and-silver her full sides shine
in the cool creek bordered by larch and pine;
silver-and-rose in the water bright
where the rapids rush and the foam is white
still must the force of the female fight
up stream, up stream.

By shallows spread on the shining sand,
where the brown bear's paw rakes the fish to land;
by deep, dark pools where the willows grieve
and, smooth as the Serpent approaching Eve,
the lamprey lurks—but her swift fins weave
up stream, up stream.

Where the kingfisher waits on the bending limb
(the ways of all fishes are known to him),
where the shadow falls from the fish-hawk's wings,
where the fly is cast and the taut line sings—
she tears the hook from her lip, and flings
up stream, up stream.

Fight on, brave trout; it is yours to give
the young of your race a chance to live.
Listen, O rose-and-silver one,
to a truth as old as the ancient sun,
that a race shall live when its females run
up stream, up stream.

The Natural Bridge

By DONALD PARSON

This causeway was not made by pygmy man.
It is a path worn by the Eternal's tread,
A Rock of Ages, a triumphal span
Where centuries may mourn their unknown dead.

It was a fossil when the race was born,
And it was mummy when the Pharaohs came,
And it was ancient on that misty morn
When Tyre was dust and Sidon was aflame.

It looked on Caesar and was not afraid,
Was adamant when Cleopatra smiled;
It was a mountain when Mahomet prayed;
It was a chancel when there lived a Child.

Within this temple all the world might weep,
Beneath its yoke all conquered armies march;
Almost within its arms a star could sleep,
Or planets weave a cobweb in its arch.

It is an organ-loft; the solemn nave
Gives forth Jehovah's voice, august and low.
It is a sounding-board, and from the cave
The faery horns of elfland faintly blow.

It seems a trellis hung with Beauty's grape,
A sacrosanct cathedral for a god;
It looms, a ladder for a dream's escape,
A cloudy inspiration for a clod.

It numbs the soul, bereaves the lips of speech,
Confutes the brain, defies the natural law.
We gaze in tears to thoughts beyond our reach
And grope for Heaven through the gates of awe.

For though it magnify a Cause unknown—
A Plymouth Rock where Pilgrims never land—
Faith still can stumble to its altar-stone
And kneel, as I do now . . . and understand.

•

Sermons in Stones

"Go to the ant: consider her ways."

By CECILIA HENNEL HENDRICKS

A highway dips across the desert now,
A winding thread between brown hills of sand;
Not alien concrete, merely native earth,
Leveled and graded, made into a road
Upon whose tawny surface, spread to view,
Appears at intervals along the way
A pattern wrought in black, volcanic ash.

Across the desert since the birth of time
The busy, prudent ant has built her hills,
Loose, piled-up cones of bits of broken rock.

Unless one hunt among the desert sand
The pebbles of black rock will scarce be seen,
So scattered are they and so far apart.
But to the ant, they are material proved
Too heavy for the wind to blow away.
The lifetime labor of one single ant
A child might hold within his close-shut palm.
With labor infinite, from age to age,
Succeeding generations of the ants
Pile up the rocky fragments, building still
Each hill that is each family heritage.

When in the course of time a road was built
Across the desert for the use of man,
The winding thread the grader cut and smoothed
Within its narrow limits counted there
Anthills enough, when leveled with the sand,
To spread an ebon pattern on the road.
From day to day, from age to countless age,
The ants worked, faithful to th' immediate task;
They nothing knew of highways, could not dream
Their hills would be the surface for a road.

What does man know of patience, what of work?
What can he fathom of the final use,
The ultimate value of his daily task?
How can he guess the use that may be made
In days that are far off, times yet unborn,
Of what his feeble efforts may produce,
The mighty sum of all his puny tasks?

A highway dips across the desert now,
A winding thread between sagebrush and sand,
Brown native earth smooth-graded for a road;
But on its tawny surface spreads an old
Amazing sermon that who runs may read.

•

Moods of Summer

A Sonnet Sequence

By LUCIA CLARK MARKHAM

I

The coreopsis simmers in the heat,
The road is lined with delft-blue chicory;
Queen's-lace to drape her cloak of majesty,
Veils of convolvulus about her feet,
August ascends her throne; the tireless beat
Of locust-cymbals and the clanging blare
Of tree-frogs' tiny trombones smite the air
With an archaic rhythm the leaves repeat.

Some poignant sweet nostalgia of the soul
Peoples the brazen noon with memories
Intangible and languorous as the breeze
That slips on stealthy pinions from the blue,
Beckoning where desert distances unroll
To palmy oases that once I knew.

II

I love the twilight's dusky quietude,
Its cool cessation from the dazzling glare
When all the clarinets of color blare
And earth surrenders to the solar mood;
I love the earnest trees that pause and brood
In green passivity and tranquilness;
I love the heavenly silences that bless
And consecrate this timeless interlude.

Now figures lightsome and mysterious
From some dim vale, remote, crepuscular,
With urgent fingers hold the gates ajar
To sweet forbidden ardors and delights
Captured in alien regions nebulous,
A sheer fantasia of enchanted nights.

III

I waken to the fairy drums of rain,
A lyrical staccato on the leaves,
A cool and silver dripping from the eaves,
A tripping tarantella on the pane;
What is the motif of that occult strain?
What crystal syllables are uttered there?
Tranquil delight, a fleeting truce with care
In this dim half-world I have found again.

That wistful music is my heart's own beat,
That rippling texture is my spirit's woof,
That mist and moisture are the final proof
Of my secure and undisputed place,
My rightful hour ephemeral and sweet
In Nature's kind and condescending grace.

IV

The huge bronze clouds are heaped in ominous
Assemblage on the bastions of the west,
A tremor of foreboding and unrest,
A sense of something grim and perilous,
A marshaling inimical to us,
As the gold sunset banners livid grow
And the portentous winds begin to blow
A malediction hoarse and venomous.

Then come the seeping cohorts of the gale
Flashing their sudden lightning scimitars;
Before the thunderous rumbling of their cars
The puny atom, I, must shrink and pale,
A shivering outcast in the universe,
Proscripted by the harsh primeval curse.

V

The rage is spent in one stupendous crash,
The great trees cease their writhings, calmly preen
Their ruffled plumage in the humid sheen,
Rising resilient from the hail's fierce lash;
A thousand flower-faces whitely flash,
The grass springs lushly, heartened and renewed,
And birds, with reinstated hardihood,
In transient rivulets careen and splash.

But I, released from mad instinctive fear,
Have found a warm half-shamed humility,
Grateful to that incalculable Force
That has not swept me from my fragile course,
But carelessly has passed and left me here
A while in my unstable seigniory.

•

Wayfaring Thoughts

By OSCAR OSTLUND

Our planet, growing up geologically, is overcoming the violent temper of its youth. Its volcanoes do not spout fire and the elements do not rattle sabres as they did in Cenozoic times. The firmament is more temperate, and the earth—less belligerent than it was—is relatively at peace with man. Evolution has granted him a truce, a fruitful interlude, which he is utilizing to create and increase the instruments of destruction by which he may duplicate the chaos of past ages, the prehistoric cataclysm, the earthquake and the flood.

• • •

There was a time when man trembled on this earth, but more and more the earth is trembling under man.

• • •

Science has greatly enriched the world's esthetic resources, opened up new intellectual vistas, but they remain in the background of most people's lives. Overlooked in the daily affairs of society, they have about the same position, relatively, as those portraits of grandma and grandpa, hung up in a bedroom that is not used much.

• • •

Our age has absorbed the materials of Science, precociously, but not its spirit. The plane of politics, for example, has not been elevated noticeably by the genius of research. Its example of Freemasonry and the willingness of its workers to give and take criticism has not been emulated by statesmen.

• • •

The humility of Science—it is the bow of peace that no international conference has learned to bend.

• • •

Naturalists get together and discuss their mistakes in a spirit of mutual helpfulness. The nations would not be weakened if they borrowed a leaf from the botanists.

• • •

The pride of spreading empires, the panoply of armaments, is incongruous in a Universe in which physical man and his material realms are relatively nothing, and only mind stands out.

• • •

The skull of the "realist", who puts his trust in force, who prides himself on frightfulness, will outlast his ideology. This has been verified by Evolution in the late, extinct, belligerent *Tyrannosaurus*.

THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Foul Deeds and Game Birds

Shortly before this appears in print thousands of school children of the country will be asked to buy wildlife stamps to help the wildlife. Wildlife unquestionably needs assistance of many sorts, but it is unwise to think that all one needs to do is to raise money and then let the other fellow do the work. If the public in general had an understanding appreciation of the problems of wild birds and mammals, and a reasonable desire to see them continue in abundance, we venture to say that great campaigns to raise money in part from the pockets of children, to provide gun targets largely for adults, would be unnecessary.

It is to provide information, which may stimulate thought on these problems as they apply to shore birds and game birds, that the insert in this number of NATURE MAGAZINE was prepared. Now what can we do with it in school? Two types of activities suggest themselves; one dealing with indoor activities designed to give an understanding possibly in an academic way of the lives of these birds; and secondly to do things in the fields and streams which will help the birds directly to prosper.

While the ideal technique would be to study all of these birds in the field there will be many teachers who will wish to use the pictures and charts in the insert as a means of significant work. For these let us suggest the following.

Without consultation of the charts let the children decide, by examining the patterns on the birds illustrated, which of the birds in all probability live among reeds and other plants for the most part. Of course the waterfowl are pictured on the water but there are some that live close to or in the water whose patterns are different from those which live in the fields and woods.

Check the pictures of the feet of the birds shown to notice modifications which are suitable to life on land and to life in the water. Which of these birds have feet obviously unsuited to getting food by scratching?

Notice the variation in the bills of the birds and select which are probers and which are of different types. Why does the length of the legs vary in the different birds presented? And of what use are long necks to the ducks and geese, which have relatively short legs? In answering these questions think of the food of the different species as well as of their habitat, and, if necessary, learn what the food is by consulting the charts.

The speed of flight of a number of the birds is given. Let the children form a judgment on this from looking at the pictures and then check their findings with the material in the charts.

Give a geography lesson on these game birds, outlining the summer and winter range, the change in range or distribution, the location of fossil remains if any, and, where possible, the paths of migration. Which of the birds known locally are native and from what parts of the world come those which are introduced?

Highly profitable lessons in civics may be developed by considering the comparative problems of protecting birds that do not migrate with those that migrate from state to state and those that go from one nation to another. Where does responsibility in these matters rest, in the children's judgment, and what is the status of individual species in your own state? If "take" records are available from the local or state conservation department, do they indicate a consistent increase or decrease in numbers and are the laws reasonably adjusted to suit the local situation?

Compare the weight of the birds as shown in the charts with the wing spread to see if the heavier birds always have the greater wing spread. If they do not, then suggest some way in which the birds must vary in the use of their wings. Look at the pictures of such birds as the yellowlegs and Wilson snipe, and note how the wings at rest still stick out to the rear, as contrasted with the wings of the rails, woodcock and some of the other species. Slender wings may aid in maintaining an erratic flight. Which of the birds have wings which it would seem could help in this?

Make circular charts indicating by sectors the percentage of the food of different species which is vegetable, animal, and so on.

Make charts of the circular type representing a year in the life of these birds and indicating the type of activity engaged in at each season. At what time would the highest individual population of a species occur?

Make a great chart of a landscape showing wooded areas as well as fields, swamps, lakes and the like. Copy the pictures of the birds considered and let the children learn to put the paper birds in the proper part of the landscape representing the birds' habitat.

If the school is located near where these birds may be seen try to recognize the tracks which some of them make in the mud and make casts of these tracks by pouring wet plaster of Paris into them.

If the children live where the young of these birds may be seen advise them not to approach nests with eggs, since certain animals frequently follow the tracks made by humans and may be led to destroy the nests.

If the young birds are ever seen have the children notice how the behavior of the parents varies in trying to provide protection.

Keep records showing the days in the year in which these birds are seen together, with some estimate of their probable abundance, the direction in which they are flying, what they are doing, whether they act individually, or in flocks cooperatively, whether they fly high or low under varying weather conditions, whether their calls are capable of any interpretation as shown by the accompanying acts, when they moult and how they behave during the season of moult, whether they moult all of their flight feathers at once, or only a few at a time, and how this affects their behavior, how they defend themselves and how the flocks seem to be kept together if they form flocks, how they behave in the presence of danger, what evidence one has that they can see, hear or feel what is going on in their environment, how they behave during the courtship period, and if their bodies are available for study what if any parasites they seem to have.

If the young of the water birds are available for study notice if they are reared for the most part in among dense vegetation, out in the open water, or in the water at the edge of vegetation. If they are most abundant at the edge how could suitable habitats for these birds be increased where the border between water and vegetation is about a straight line?

Consider what would be the important difficulties of water birds if drought lowered the water-level in late summer when they were unable to fly? What would be important difficulties if floods came during the nesting season and which birds would be most seriously affected?

Notice which if any of these birds congregate in flocks of mixed species, that is whether a flock of ducks has but one species in it or what is its species composition. Are ducks commonly found flying in the same flocks with geese and do the shore birds mix in flight with the waterfowl to any considerable extent?

Examine such books as Peterson's, which emphasize the field characters of birds, and get the field marks of the different species of waterfowl fixed in the mind by making small paper ducks properly marked and then mixing them up and learning to name them correctly. Have the children carry these paper birds in their pockets and review them repeatedly until the characters are firmly established in their minds. This will improve greatly the accuracy of any reports they may care to make.

If waterfowl or game birds are killed locally get samples of the contents of their crops to help in the study of food habits. These contents may be preserved by dumping them in formalin and then drying them or by simply drying them without treatment. A collection showing "food of grouse", "food of quail", "food of mallards" and so on will be highly informative and lay a basis for an intelligent conservation philosophy.

Interview local sportsmen to get some idea of the numbers of shore birds and game birds taken in the vicinity. Keep these records in the school from year to year to see what if any variation occurs among the resident species and among the migrants? If the resident species are not maintaining their own it is unreasonable to blame others because the migrant species may be on the decrease.

In winter provide food for game birds and waterfowl where conditions make this advisable. The game clubs and game wardens usually are more than willing to cooperate in this sort of work and to have help from young people of high school age.

Where possible encourage the establishment of sanctuaries where game species may have complete protection and if no such sanctuary is in existence locally get some farmers to cooperate in posting their lands for this purpose.

Get farmers to cooperate in using flushing bars which frighten nesting birds when grass is being cut so that they may escape to return unharmed to their nests. Get the cooperation of farmers to leave a row of standing grain along the field borders for these birds and possibly a few shocks of corn which may supply food and shelter in the winter.

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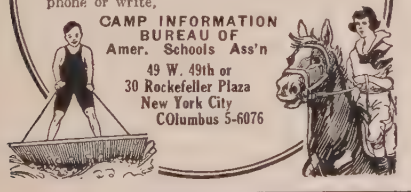

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Send for illustrated, descriptive catalogue Address: Professor George R. Green, Director of the Nature Camp.

THE PENNSYLVANIA STATE COLLEGE

State College ★ Pennsylvania

CAMERA TRAILS

(Continued from page 187)

cover glasses issued by E. Leitz, Inc., 730 Fifth Avenue, New York. The glasses are uniform in size and thickness and the edges are ground smooth. For complete information on these glasses and other materials and equipment for projection write direct to the above company. Don't forget to mention NATURE MAGAZINE.

Any photographer who has ever spilled developer on his best suit immediately learned the advantage of a protective apron. The Raygram Corporation of 425 Fourth Avenue, has announced a new, rubber-coated fabric apron light in weight but sufficiently heavy to withstand wear. It has a pocket for thermometers, pencils and gadgets, and a trough at the hem to catch the liquids that might otherwise run down to shoes and clothing. Its list price is only $1.00. For information on this and the other Raygram products write to the above company and mention this department.

Again for the photographer whose dark room has alternating current we suggest the Fink-Roselieve timing device that audibly ticks away the seconds. While we can time enlargements by watching the second hand of a watch or clock, it is much easier to be able to count the seconds without having to take our eyes from the dodging or other manipulation that we may be giving our printing. The gadget is compact and inexpensive. It is one of many dark room attachments manufactured by the above company who will send full information to any readers of Camera Trails who write to them for it at 109 W. 64th Street, New York City. Don't forget to tell them you read of it in Camera Trails.

The Omega Enlargers are a group of high precision enlarging machines that are constructed in strict accordance with the best engineering design. Made to take negatives of various sizes, each one is tops in its class. They are manufactured by Simmon Brothers, 3706, 36th Street, Long Island City, N. Y., who have a folder describing the entire line waiting for readers of this department. When you write for yours, tell them of the size of the negative which you use and mention Camera Trails.

An excellent gadget for the drying of prints

Canadian Nature

This bi-monthly magazine contains 64 pages of fascinating nature stories, photographs, drawings and color plates. Children's stories, blue printing, project planning, nature walks, teaching methods. Used by schools, libraries, naturalists. $2.00 a year, checks or currency. Write **Canadian Nature, 177 Jarvis St., Toronto, Canada.**

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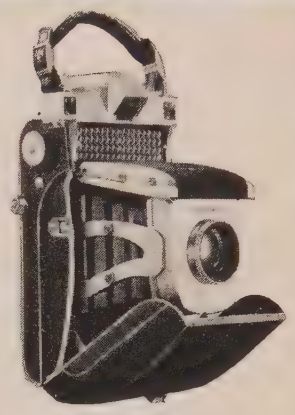

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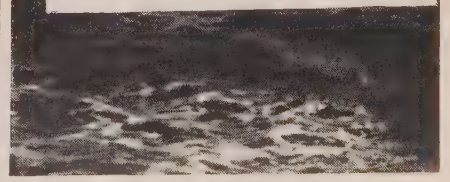

ONLY EASTMAN MAKES THE KODAK

is easily made from a length of chicken wire and a few yards of unbleached muslin or cheesecloth. Make a cylinder about 14 inches in diameter, and as long as you wish, and wire this tight. Then roll the cloth around this wire frame. To use it, unroll the cloth on the floor and lay the prints face down on it. When the cloth is re-rolled on the frame the prints will be face out and held firmly in place. The whole thing may then be hung over a radiator or placed in any convenient spot to dry. The prints will have a slight backward curl.

Willoughbys has introduced two new dark room paints for the waterproofing and preservation of trays, tanks, sinks, and so forth. Both Willo-White and Willo-Black dry within two hours and are acid and alkali resistant as well as waterproof. They are available from Willoughbys, Inc., 110 West 32nd Street, New York City.

Home movie makers will be interested in the new 1940 movie picture catalogue issued by Don Elder's Home Movies, 739 Boylston Street, Boston, Mass. Write for your copy, which includes most of the cameras and projectors now on the market and a wide range of motion picture accessories.

This department is maintained for the benefit of its readers and offers a service to all the friends of NATURE MAGAZINE to help with their photographic problems. Its editor will also welcome any suggestions or criticisms that you have to make about Camera Trails. Send your communications to Norris W. Harkness, NATURE MAGAZINE, 1214 Sixteenth Street, N. W., Washington, D C.

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THE APRIL ECLIPSE

(Continued from page 234)

the 100-year period in the United States, that of 1930 IV 28, which was total for a short distance in California and Idaho for a period of a little over a second. So, although there must be at least two eclipses of the sun every year, and may be as many as five, the occurrence of an eclipse that is total or annular in any one locality is a rare phenomenon, and the annular eclipse of April 7 visible in the Southern States should be of unusual interest for that reason if no other.

Mercury will be at western elongation in the morning sky on April 12, but will rise less than an hour before the sun. Venus will be a magnificent object this month in the west, reaching greatest eastern elongation on April 17. Mars is in the west and is in conjunction with Venus on April 11. It passes so close to Aldebaran that the two form an interesting pair of objects both red in color. Jupiter is in conjunction with the sun on April 11, and Saturn on April 24. They are too close to the sun for observation this month.

For Animal Breeders

Of primary interest to animal breeders, whether concerned with domestic mammals or those on fur farms, is *Animal Sex Control,* by Carl Warren. This book discusses methods of pre-determining and influencing the sex of animal offspring. It is published by the Orange Judd Company at $1.75.

ON THE RECORD

One of several reasons for the amazing come-back of the record business is its ability to anticipate what the public is going to want tomorrow and then satisfy that demand in the smartest manner. A case in point is the attractive album gotten on the market even before Walt Disney's latest contribution to all youngsters from four to twice-forty, "Pinocchio," has reached the screen. This album (P-18; Records 26476-26378) contains three discs recorded from the actual sound track of the motion picture. The album itself is delightful, printed in color and presenting Pinocchio, Jiminy Cricket, the Blue Fairy, Gepetto and the rest.

Having been taken from the original sound track, the bits of dialog between these grand creations of Disney's are interpolated with the songs. One finds it difficult to keep from running "When You Wish Upon a Star"—sung by Jiminy Cricket—time and again. The album is a delightful experience before one has seen the film, and should be more so afterward because it will bring back parts of it again and again. The songs, with their attendant dialog, are "Give a Little Whistle", "Hi Diddle Dee Dee", "When You Wish Upon a Star", "Little Wooden Head", "I've Got No Strings", and a finale combining the charming star song with "Turn on the Old Music Box".

▪

One of the current song hits is "The Little Red Fox". Of course the tune itself has wide appeal, particular to the younger set who can dance as fast as the tempo requires. (We admit we can't.) But we cannot help feeling that the lyric has particularly wide appeal because the little red fox in it defies the barking dogs and the hunters. "N'ya, n'ya, ya can't catch me," he says, and ducks into a hollow log. His successful defeat of his pursuers appeals to the instinctive feeling for the underdog—or the under fox. Here is where a lyric is fully as important as the tune. It has been recorded by several orchestras and popular singers, one of these being on Bluebird record #B-10581, the song by The Three Blue Notes.

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If you happen to be a frequent—or, even, infrequent—zoo-goer, get the Bluebird record #B-10574. It is a recording by Cyril Smith of that sad, sad story by Marriott Edgar of "The Lion and Albert". Albert Ramsbottom, as you may know, resented the somnolence of the lion in the zoo cage and poked him in the ear with his little horse-headed stick. This the lion resented, scooped Albert into the cage and nothing was left but his cap; "an 'im in his Sunday clothes, too". This vexed Mrs. Ramsbottom seriously, and the succeeding negotiations are grand. On the other side of this disc is a recording, also by Cyril Smith, of the defiance of Old Sam, who, because the sergeant knocked it from his hands, refused to pick up his musket, and so held up the Battle of Waterloo until the Duke of Wellington personally pled with Sam to arm himself.

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It's interesting, going over a list of the current Victor releases of popular songs recorded by famous popular orchestras, to note the number of song titles that draw upon Nature. For example: "The Woodpecker Song", recorded by Glenn Miller (#B-10598); "Some Day You'll Find Your Bluebird" and "Run, Rabbit, Run", recorded by Enoch Light (#B-10597); "Last Night's Gardenias", recorded by Mitchell Ayres (#B-10595); "The Moon and the Willow Tree", recorded by Blue Barron (#10606).

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INDOORS AND OUT

(Continued from page 191)

and rider daring death in an Ohio floodtide; red men in canoes hunting scalps along the James; or spike-booted he-men tossing logs and villains about in technicolor abandon on the Columbia."

Mr. Dana remarks in one place that "to produce a well-rounded human being takes just as much exposure to nature as ever." He calls frequent attention to the wildlife along the river and in the region—referring, for example, to the apparent extirpation of the sea otters and their recent reappearance, though I believe that this was in 1938 rather than a year later, as either Mr. Dana or his proof-reader has it. Unfortunately Mr. Dana does not seem to have heard about the establishment of the Sacramento Migratory Waterfowl Refuge on the site of the former Spaulding Ranch near Willows, California, for I am sure that this sanctuary and winter concentration area for many thousands of geese and ducks would have interested him very much and provided a few additional paragraphs for his book. The refuge was established on February 27, 1937, and now has a resident manager provided by the Bureau of Biological Survey.

It is encouraging to know that Mr. Dana met a trapper with some of the new-type chain traps so ardently advocated by Vernon Bailey and others, and that the trapper was not only satisfied to use them, but enthusiastic.

" 'The old jaws are goin',' said Sunset Sam, with a satisfied glint in his eye. 'This business is finally goin' scientific. This'll hold an animal without breakin' a bone, crushin' 'em up, or hurtin' the pelt. An' you can turn the females loose without hurtin' 'em.' "

And, returning to April thoughts, it is especially interesting to note for this month's issue of NATURE MAGAZINE Mr. Dana's report that the Mount Shasta Fish Hatchery, the "largest in the world, puts fifteen million trout fingerlings into the streams each year, and an added five million salmon."

Photographic Handbook

If you take your photography seriously and deeply you will find in *Handbook of Photography* the final and most complete word on the technique of the photographic process. Here is an 870-page book to which twenty-three photographic specialists have contributed, and which Keith Henney and Beverly Dudley, editor and managing editor respectively of *Photo Technique,* have edited. As one of the snap-and-hope photographic school this book, with its diagrams and formulae, is intimidating to us. But we have friends who will revel in it, understand it and profit by it. Still, motion picture, color, infra-red and speed photography, as well as photomicrography are all covered. An excellent index and bibliographies make this a notable photographic book. Published by Whittlesey House, it sells for $7.50.

THE ICE FIELDS OF JASPER

(Continued from page 198)

Columbia Ice Field has been brought within easy reach of all those who wish to visit this mighty spectacle of Nature.

Like all other regions of the Dominion that have been dedicated to the people of Canada as National Parks for their benefit, education and enjoyment, the Columbia Ice Field area, and the surrounding territory within the Jasper Park boundaries, form a sanctuary for many interesting forms of Canadian wildlife and rare and beautiful flowers indigenous to its lofty elevation. The flora of the higher altitudes is among the most beautiful in the world. More than 500 varieties have been identified in the Rocky Mountains, and their exquisite color, fragrance and delicate loveliness add the last word in enchantment to the region. While they grow in rich profusion in the valleys and on the lower slopes, it is on the alpine meadows above timber line, where even the stubborn little pines and spruces have been beaten back by the cold, that many wild flowers are to be found at their finest. At elevations of more than 7000 feet are veritable seas of color. Higher still, at the verge of perpetual snow, the "dauntless flag of flowers" will still be found waving, crowding its summer life-cycle into a brief season of perhaps six weeks. On the high passes, stretching in all directions and well above forest growth, one will find the white heath and the red mountain heather, the latter first cousin of its famous Scotch namesake. At still higher altitudes grow the saxifrages, the white dryas, and the frail pink-tipped everlastings. To all lovers of Nature the wild flowers of the national parks will be forever a constant source of delight and beauty.

By some secret call-language, or by some wireless system of their own, the wild animals of these vast reservations appear to have communicated the fact that within the park boundaries they are safe from the huntsman's rifle and treacherous deadfall. As a result each year sees many splendid specimens of the larger species, such as deer, goats, and bears, not only increasing from the stocks already within these favored areas, but coming in from the mountains outside to multiply and make their homes in these protected regions. The mountain goat, the only representative of its family on this continent, is the most characteristic big game animal of the Canadian Rockies. Their cloudy pastures among the upper crags offer splendid protection, and their marvellous alpine agility has in a large measure assisted in the preservation of their race. The new highway, which affords easy access to the Columbia Ice Field, offers the camera enthusiast excellent opportunity to photograph this interesting animal in its native haunts, as there are often unexpected meetings with these and other creatures of the wild. The inroads of Indian hunters, the advance of settlement, and the seeker for head trophies, almost drove the bighorn or Rocky Mountain sheep to the point of extinction. It was not until the establishment of national parks in the Canadian Rockies that its numbers began to increase. So much had it suffered from ruthless slaughter that a little less than three decades ago the Smithsonian Expedition to the Jasper Park territory encountered only one band of this species, which they found in the Maligne Lake country. Due to the rigid protection afforded by the Government of Canada since then, mountain sheep may be seen in all parts of the park, and their numbers today are believed to reach many thousands. A similar story might be unfolded of the grizzly bear, the elk or wapiti, the beaver and other animals of the park areas, now free to multiply in an environment where no trap may be set, no gun fired. The increase of animal life in each of Canada's National Parks is the result of eternal vigilance of an administration which loves and is determined to protect the wild life heritage of these appealing and charming domains.

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NATIVE VINES FOR GARDEN USE

(Continued from page 232)

thriving as easily in the shade as in the sun.

The various forms of wild smilax or green briar, although terrifically spiny, may be used in corners of the wild garden, or, perhaps, to prevent the newsboy from cutting across the corner of the yard. Their rich green foliage, bright green stems and black berries make them decorative the year round.

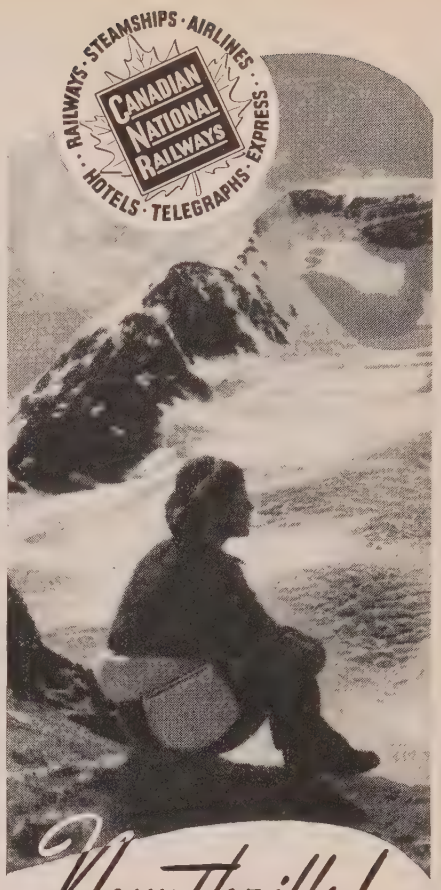
Found usually in low land and river bottoms, the moonseed, *Menispermum,* has an unusually lovely dark-green leaf. Although the flowers are inconspicuous and the fruit is poisonous, it may be used in an odd corner of the yard to advantage.

Tennessee Birds

The Tennessee Department of Conservation has embarked on a progressive program of Nature and conservation education that holds great promise. In fact, it has a fundamental soundness of approach that we wish might be followed in other states where propaganda and special interest influence too often color what comes under the head of education. Most recently Tennessee has brought out an attractive 76-page booklet entitled *Birds of Tennessee in Verse and Story.* After preliminary information about birds and their value, the booklet devotes two facing pages each to a verse and prose text about thirty different birds. There is a blank space in which may be pasted small bird pictures made available by Church and Dwight Company, baking soda manufacturers. Copies of the booklet, together with the colored pictures, are available from the Educational Service, Department of Conservation, Nashville, Tennessee, at twenty cents a copy, or fifteen cents a copy when 25 or more copies are ordered.

You Could Do It, Too!

This is the title given to a book that is likely to interest no few people, even though they do not act upon the assurance contained in that title. It happens to be a practical application of that often-heard observation, "I'd like to go off to the South Seas and live." The Parsons family, beset by the depression, did just that, gathering together every financial resource they could for the quest. They went into the back country on Tahiti, they made themselves a home and won security. Written by Hester Parsons, it is a matter-of-fact story of why and how the family did it. The book is published by Nationwide Press, 1104 Prospect Ave., Cleveland, Ohio, at $2.50.



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OUR GARDEN EDITOR

It is with pleasure that we announce the appointment of Adolph Kruhm, noted writer on garden subjects, as Garden Editor of Nature Magazine. Beside contributing interesting and valuable articles to our pages, he is at your service in solving your garden problems.

We asked Mr. Kruhm to give us a preview of his plans for coming months and here is what is to come:

May—Stream Gardening and How It's Done.

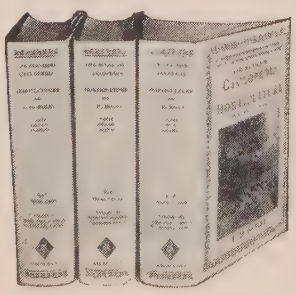
June-July—Fighting Bugs to a Finish and Sane Watering in the Garden.

August-September—Pygmy Folk of the Garden.

October—Daffodils and the New Tulips.

November—Hyacinths and Bulbs Indoors.

GARDENS GROW FROM BOOKS



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MOW YOUR LAWN EVERY DAY!

by George O. Stumpp

Do you find this a startling piece of advice? Do not take it too seriously, but the more often you mow a lawn the better the turf will be. When you cut frequently, the clippings taken off will be so small that only a slight shock is given to the plant. If the clippings are long, the center of the plant is exposed suddenly to strong light, with harmful effect on the grass plant. A putting-green which is, or is expected to be, the most perfect of lawns, is often mown six times a week.

Do not confuse *frequent* cutting with *close* cutting; your machine should be adjusted so that when you have finished mowing, the surface of your lawn is neat and even, but the grass is still moderately long. Adjust your mower by setting the roller to leave the grass an even 1½ inches long. You may increase this to two inches during July and August, because it is helpful to have the grass long during the hot months.

When the hot weather is over, lower the machine back to its 1½ inches in two stages, each of ¼ inch. If your lawn is so large that the routine mowing necessary for good turf is likely to become a burden, a gasoline mower would solve this difficulty. Efficient reasonably-priced and well-made machines are now available and are a sound investment for lawns of 2500 square feet or more.

Another suggestion that may sound odd is, "Don't water in the spring"; followed by another, "Don't water in the fall." Should May, June, September and October be so dry that your lawn is likely to suffer, you must, of course, sprinkle to keep the grass alive. If there are some newly-sown seeds in the lawn, you will have to keep them moist between rains. But, if you sprinkle unnecessarily, when the lawn does not actually need water, and if you keep the surface always moist by artificial means at seasons of the year when grass grows well enough without help, your grass plants will have such shallow roots that they will be unable to survive the heat of July and August. So water generously in July and August, but sparingly, or not at all, during the remainder of the year.

Seeds must be sown early to make a new lawn or to repair an old one. Cold, blustery weather, with some frost following the sowing of grass seeds, is quite helpful. Every week's delay in getting seed into the ground in spring means more weeds in the summer. If you plan a new lawn, purchase your plant-food and grass seed ahead of time. Be prepared, be generous as to quantity, and get the best quality. As soon as frost is out of the ground, dig and turn each spadeful; spread the fertilizer and rake smooth; rush in the seed and rake again.

for your Garden

If you are to repair your present lawn, and the grass went into winter long and unkempt, it had best first be burned off. The surface may then be raked savagely with an iron rake. Broadcast fertilizer over the surface and rake again. After forty-eight hours, sow grass seed, and rake a third time.

Use a plant-food or "fertilizer" manufactured by a reputable concern and made especially for lawns; it should be "one-half organic," which means that half the elements built into the compound are derived from organic substances such as bone-meal, dried blood, cottonseed meal, manure or other animal or vegetable refuse, and the other half from nitrate of soda, phosphate of ammonia, muriate of potash or some other combination of chemicals. Follow the manufacturer's directions as to how much to use; probably the recommended amounts will be in the neighborhood of 25 pounds per 1000 square feet for a new lawn, and half this amount when renovating your old one. But the quantities to be used vary, so follow the directions carefully.

In conjunction with these plant-foods there is a lot of grass-growing help to be found in top-soil from elsewhere, even if it be only from some other part of your own garden. After applying plant-food, any quantity of good soil may be used with advantage, from ¼ inch to 2 inches or more. Desirable always, added top-soil is essential if you are lawn-making on terrain which has lost its natural layer of soil through erosion or grading.

There are some interesting novelties this year to help the lawn maker. He can purchase an all-purpose dressing made up of soil-ingredients, plant-foods, fungicides, insecticides and seeds that can be applied again and again to renew patches of killed turf or to improve grass until a perfect lawn is produced, and this can be achieved in any situation where there is enough light to support growth. Then there are the culture dilutions, actually compounded for the soilless growth of plants, which may be sprinkled on a lawn to supply everything growing plants need in chemical form, and which they can utilize immediately. Bolts of a net-like cloth can be pegged over seeded areas, to hasten growth by diffusing light, protect against fluctuating temperatures and prevent the washing of soil, fertilizer or seed from sloping land.

One seedsman offers an elaborate machine for the gardener who makes lawn growing his special business. It is pushed over a threadbare lawn, and as it travels along, sharp discs cut half-inch deep grooves in the sod. From a hooper, grass seed is dropped into the cuts, and a closing device follows along each cut. This is an ideal way to get seed into a jaded turf without waste and without damaging what few grass plants may already be there.

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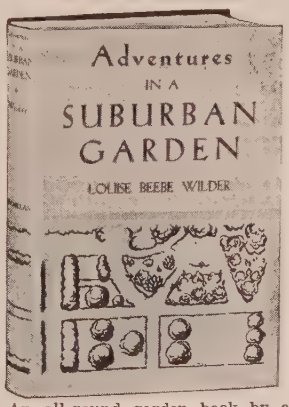

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Pelican and Gull

Frederick Kelly, son of Dr. Howard Atwood Kelly of Baltimore, is on a cruise to distant places and writes back to his father of the things of Nature he sees along the way. One of his most interesting recent reports is of an odd pelican-gull fishing combination repeatedly observed off Panama. The pelican would come sailing along about thirty feet above the water, spot a fish and smash into the water, getting his fish and a pouch full of water. Young Mr. Kelly writes that "in order to get rid of the water without losing his meal, he rests, two-thirds submerged, on the surface, all the while splashing the water from the skin-like pouch by pressing it against his breast. During this operation his faithful, and ofttimes, I think, irritating sea gull companion perches lightly with outstretched wings on the top of his white dome. About once out of five times the frightened fish at the moment of capture has disgorged another and smaller one. This is the little gull's share of the feast." Once the pelican has eaten he is off again, followed closely by his parasitic attendant.

Broad-leafed Trees

The most recent copy of the Science Guide for Elementary Schools published by the California State Department of Education bears the title *Common Broad-Leafed Trees*. It is written by Lea Reid and is Volume V, Number 10, in this excellent series of school aids. Single copies are available from the Department at Sacramento, California, for fifteen cents.

Oregon Reptiles

Students of reptiles and amphibians will find valuable *The Amphibia and Reptilia of Oregon* by Kenneth Gordon, published by Oregon State College at Corvallis, Oregon. An 82-page, paper-bound booklet, it covers the known 64 amphibians and reptiles of the state, ten of which have been added to the state list within the past six years. There are several plates. Copies are available at fifty cents from Oregon State College.

Correspond?

James Kinsolving, Box 191, Cedar Grove, West Virginia, would like to correspond with others interested in the study of Nature and in Nature generally.

Bombing Volcanoes

In 1935, when Mauna Loa volcano in Hawaii erupted, United States Army planes dropped twenty bombs along the edge of the lava flow. A recent expedition found that the bombs had landed with marked accuracy and had checked the flow of the hot lava, thus preserving the town of Hilo, in the path of the flow. The theory behind the bombing was that a tunnel would thus be blasted so that the hotter molten rock might have a chance to cool and harden, thus slowing and ultimately stopping its progress. The theory was a good one, for the flow gradually slackened and the recent check-up showed how.

THE STORY OF THE STREAM

(Continued from page 208)

of efficiency, a point that must be reached and constantly improved, since anglers are clamoring for fish of larger size. The problems of the fish-culturist become more complex with each ensuing year. Rising costs of production have compelled the hatcheries to seek more economical food to feed fish that must be kept for months instead of being planted as fingerlings.

Disease is the largest cause of loss in hatcheries, and the concentration of great numbers of fish is conducive to such outbreaks. Although a comparatively new science, fish pathology has already been the means of tracing the cause of many hatchery diseases, and the discovery of effective treatment.

Selective breeding has also developed into a most interesting and productive field for experimentation. It has been found that by mating superior fish, and rearing their progeny in isolated lots, careful selection can be made of those that show rapid growth, resistance to disease, and increase in egg production. Such experiments have proven that, in three generations, such progeny will spawn a year earlier than wild stock, yield twice the number of eggs, show more resistance to disease and be far hardier than the average run of hatchery stock.

Today there are nearly five hundred fish hatcheries in the United States operated by the Federal and state governments, half of which are producing fresh water trout. Upon their efforts depends one of our greatest recreational and cultural assets. According to a report made to the Secretary of the Interior by the Bureau of Fisheries last November, $877,309,009 was spent for fishing licenses, tackle, photography, transportation, guides, food, lodging, bait, boats and other necessaries during 1938. Anglers spent more than $35,000,000 for tackle, and $10,000,000 for licenses. In the State of Maine alone, more than $40,000,000 changed hands.

Our Federal Government and our states are doing their part to provide healthful recreation throughout the land. For the fisherman a new era in the preservation of our native trout is off to a promising start, and while it will be many years before comprehensive stream surveys will be completed on a national scale, our fish-culturists are bending every effort to that end. It is the responsibility of every sportsman among our anglers to aid this work, to help in checking waste of present resources and to join in the fight for pure streams, without which there will be no fish, whatever the efforts of the scientist.

Puss and Martins

"Puss and I were relaxing on the lawn one evening last summer when Puss was attracted to the large martin house by several birds flying in and out of the opening," writes Miss Opal Hoover Young of Chester, W. Va. "All attention, she watched, poised for action. The birds spied the cat, and then began a most amusing performance. Down swooped those birds in a group, just within reach of the cat's outstretched paws, and in a flash were in the air again. For ten minutes or more they continued to tantalize poor Puss, flying down close to her, describing a circle in the air, down again and up again until they apparently tired of their sport and one by one flew away."

"FERDINAND" THE HAWK

by Margaret Dodge Belden

One bleak afternoon about the middle of January, I was sitting in front of a cherry fire, when I heard a strange noise like a dull thud, thud. Apparently it was coming from the feeding tray outside the kitchen window. At first it sounded like the noise "Sammy" Jay makes when he cracks sunflower seeds on the side of the tray. But it was too dull for that, and my curiosity became too much for me and led me to investigate.

Looking out the window, I was surprised to see a strange-looking bird. I blinked, he blinked, and I blinked again. It looked like a hawk, and had a hawk's beak and talons. But why should a hawk be sitting on a feeding tray? The bush near by was full of English sparrows, and if it were a hawk why should they so calmly sit there? He was about the size of a Blue Jay, rather small for a hawk. His breast was a beautiful bronzy-gold. I was still too astonished to take in all his markings. He just sat there on a piece of suet, blinking. Soon he flew away.

Looking him up in Forbush, I could not decide just what he was, and still needed to see him again for further identification marks. The next morning he came again, took a piece of suet and flew off with it. The next day, when we were doing the dinner dishes, he came again for more suet. We were able to identify him by the markings on his face. He was a Sparrow Hawk.

Several days passed before he showed up again. One afternoon I found him calmly sitting on the tray doing nothing, just sitting. Whereupon we named him "Ferdinand", for like the other "Ferdinand" he was different from his kind. Instead of sitting under a cork tree smelling flowers, he liked to sit on a feeding tray and calmly eat suet.

Good Provider

What might be called a believe-it-or-not incident of the bird world took place in the outskirts of a small town in central Illinois, writes Miss Opal Hoover Young of Chester, W. Va. A robin and a sparrow had nests built side by side near the end of a branch on a large tree. Day after day during the nesting season while the birds were sitting on their eggs, the male sparrow brought food both to its mate and to the robin next door, who accepted with good grace this unusual attention from her less aristocratic neighbor.

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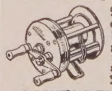

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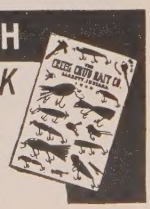

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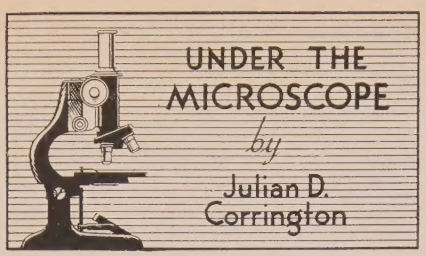


'Sblood!!

Gather 'round closely, mates; 'tis a dark night and a bloody business is afoot. We are about to conspire in a little stabbing fray and expose to view under your microscopes the most wonderful and complex fluid in all the world—blood!

As met with during those unfortunate and usually minor household accidents, this life substance is a bright red, rather thick liquid, somewhat viscous and with a characteristic odor which most persons find disagreeable. Under magnification, however, in thin films, the red color disappears and is replaced by a faintly greenish, straw-yellow hue. The red is due to interference with white light on the part of stacked up piles of the red corpuscles, each of which acts as a lens. Most of us know that blood is a fluid tissue in which the cells, called corpuscles, are separate from one another, float freely, and consist of two sorts, the reds and the whites.

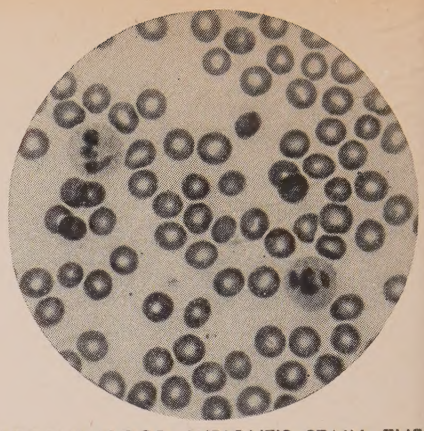
But this is by no means the complete picture. There are many kinds of white corpuscles, or *leucocytes*. The fluid *plasma* in which the cells float is not at all a simple liquid. Upon exposure to air, solid strands of *fibrin* coagulate out, to effect a clot, centering around minute cell fragments called *blood platelets*. The remaining liquid is a clear watery *serum*, but still very complex in that it contains an immense variety of substances in solution. There is the gas, carbon dioxide, an excretion on its way to the lungs to be expelled; urea, passing from liver to kidneys for voidance also; digested foods of all classes—amino acids, fatty acids, glycerols, simple sugars—mineral salts, water. There are the many hormones, those chemical messengers which effect profound changes throughout the body; indeed, the blood serves the body in many ways, classified broadly under the heads of transportation and protection.

Manufacture of a permanent and stained slide of human blood is relatively easy, though several trials may be necessary to secure a really good slide. It is highly important to observe precisely all directions for obtaining blood in such a way as to avoid infections. Swing the arm somewhat violently several times to drive blood to its extremity, then wrap a strip of cloth spirally around the thumb, from base upward. Cleanse the back of the thumb, at the base of the nail, with 95% alcohol, then sterilize a needle by flaming it or dipping it in the alcohol, and prick the skin just back of the nail. Wipe away the first drop that exudes and use the second for mounting. When finished, apply tincture of iodine to the puncture.

Some technicians prefer to make their blood film on a cover glass, others on a slide, and both methods will be described and should be followed for practice. Speed is the primary essential, to prevent clotting and other changes brought by exposure to air. For the first method, have ready two absolutely clean cover glasses, held in cover glass forceps or propped against some small object so that they can be picked up by the edges quickly. The instant the second drop of blood appears from the puncture, catch it upon a cover glass and immediately cap this with the second cover. Without pause, draw the two covers apart by sliding one sidewise off the other. This must be done quickly, without any pressure, and should result in a uniformly thin film of blood on each cover. Wave these about in the air to fix the cells by rapid drying, then place them face up on the work table for staining.

For the second method, have at hand two clean slides. Place the drop of blood on slide 1 near one end, then immediately take up slide 2 in the right hand and apply one end, held at slightly less than a 45° angle, to slide 1 just beyond the drop, toward the far end of slide 1. Allow the blood to make contact between the end of slide 2 and the surface of slide 1, within the acute angle where the two slides meet. It should spread rapidly between them. Then push slide 2 rapidly away from you, along the surface of slide 1. The blood will follow and be drawn out along slide 1 into a thin film. This operation may be practised with red ink until speed and dexterity are acquired. Wave the film in the air to dry, then place slide face up on the work table before you.

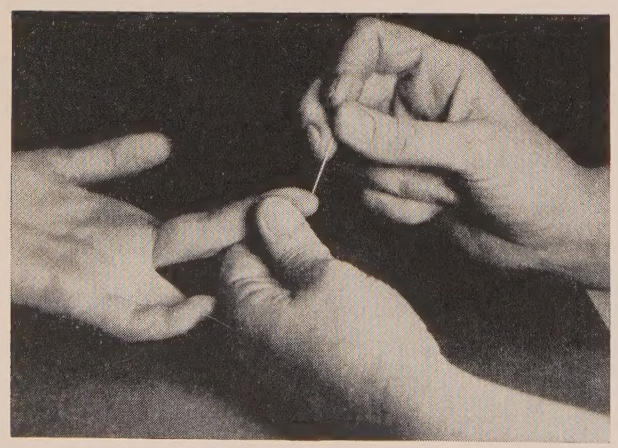
Staining proceeds the same by either filming method. Cover the dried film with a measured quantity of Wright's stain—such as 1 drop, 2 drops, etc. for one minute, timed accurately. Then, without washing off this stain, add to it an equal quantity of distilled water. That is, if you used 2 drops of stain, add 2 drops of water. Allow to stand for 2 additional minutes, then wash and differentiate in distilled water. Wright's staining solution for blood is best purchased ready-made, as its manufacture is complicated.



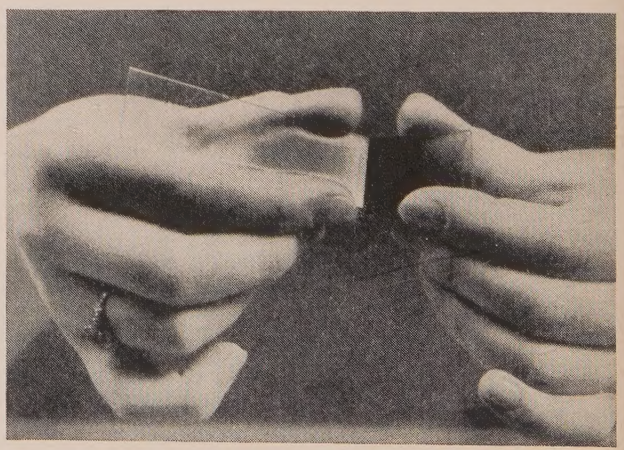
HUMAN BLOOD, WRIGHT'S STAIN. THE TWO LARGER CELLS WITH IRREGULAR NUCLEI ARE NEUTROPHILS, A TYPE OF LEUCOCYTE; THE OTHERS ARE ERYTHROCYTES

By differentiating is meant the bleaching of the several colors in this stain until of just the right hue to distinguish the various items present, especially the several kinds of leucocytes. The red corpuscles, or *erythrocytes*, should be salmon-red in color. The water acts as a destain and will extract all color if allowed to act too long. Wipe the bottom of the slide with a cloth and mount it quickly for examination under the microscope, keeping the film wet with water at all times. When the erythrocytes are salmon, and the nuclei of leucocytes purple or blue, the destaining has gone far enough. Longer staining or shorter washing yields bluer slides; shorter staining or longer washing gives redder results. Consult any textbook of histology and compare your slide with the colored plate of the various blood cells under Wright's stain, and keep trying until you make one as good, at least in certain areas, as this plate.

To stop the destaining action, blot the film gently with a piece of filter paper. When completely dry, add a drop of balsam and a cover glass. Unless the balsam is absolutely neutral or slightly alkaline the stain will fade and to avoid this many technicians keep a small piece of marble in their balsam bottle at all times.



PRICKING THE BALL OF THE FINGER TO SECURE THE BLOOD FOR MAKING THE SLIDE AND STUDY OF ITS INTIMATE SECRETS



MAKING BLOOD FILM ON SLIDE BY PUSHING SLANTING SLIDE TOWARD FINGERS. BLOOD IS UNDER THIS SLIDE AT CONTACT AND NOT SHOWN

Advanced Hints

In connection with the preceding article on making stained blood films, certain additional methods may be undertaken by those who have mastered the preparation of a well-stained film.

Rectangular Cover Glasses

If the film has been made along the whole length of a slide, as per the second of the two methods of filming just explained, the ordinary square or round cover is inadequate. Rectangular covers are procurable in many sizes, up to that which will cover the entire slide. Such a cover should be used on this type of film, and a word as to the cleaning of this large sheet of very thin and fragile glass will not be amiss. After washing in a glass-cleaning mixture (Jan., 1940, issue) or in strong alcohol, following by thorough rinsing, the cover may be laid flat and each side polished in turn, but it will be found best and quickest to use two small, very flat and smooth wooden blocks. Cover each block with a piece of old and clean linen, as from discarded handkerchiefs, place the cover between these and polish gently and slowly with a rotary motion. This avoids unequal pressures, which are certain to break the glass.

Uncovered Slides

Stains will last much longer if the slide is not covered at all, but the method is for use only with water or oil immersion objectives. Films must be made on slides and not on covers. When the area selected for high power study has been located, put on a drop of cedar oil—the variety made expressly for an oil immersion lens—and lower this lens into focus, using a strong artificial light. After examination, carefully and gently wipe excess oil from the film surface with a bit of lens paper. This can be done without injury to the blood cells, the small amount of oil remaining doing no harm. Similarly clean the objective. Old and caked smears of oil can be removed with a cloth dampened with a drop of xylene, but apply sparingly and carefully. Too much xylene may soften the balsam used in many such objectives to hold the minute lenses in place, and thus harm this expensive optical item.

Blood Parasites

Wright's stain is excellent for malaria and trypanosomes, but is unsatisfactory for microfilariæ, for which iron hæmatoxylin is much better. Most hospital workers prefer uncovered slides in this work.

Another Mountant

Instead of balsam either Euparal or Diaphane may be employed with superior results. These mountants intensify the stains and render them permanent, but some practice may be necessary to avoid inclusion of too many air bubbles.

Mitosis in Blood Cells

If you do any work in embryology, try staining a section of the 72-hour chick embryo with iron hæmatoxylin; preferably a longitudinal section through the heart or lengthwise of some large blood vessel. Many erythrocytes will be found in the process of cell division and are beautifully demonstrated by this technique. For details of iron-h staining, see the October, 1939, issue. We recommend also that you try out this stain with an ordinary blood smear.

Comparative Studies

In mammals, the erythrocytes are non-nucleated, losing their nuclei during development. As a result they present the shape of biconcave, circular discs. In all vertebrates below mammals, however, the red blood cells are oval and retain their nuclei throughout life. Since these central bodies cause a bulge in the cell, the outline is biconvex, not biconcave. Try blood films stained with Wright's from one of each of the main classes of vertebrates and you will be vastly interested in the comparative study of such a set. Recommended common forms are a fish, frog, snake or turtle, any bird, such as a chicken. Amphibia have much the largest corpuscles of all, the salamander *Amphiuma* possessing the largest known.

Mammals Other Than Man

Some readers may be favorably situated with respect to knowing someone in authority at a zoölogical garden—the head veterinarian being the best person—and may be able to secure the very small amount of blood necessary for slides from a variety of unusual animals. Members of the camel family—the camels and llamas—are unique among mammals in having oval corpuscles, while goats have the smallest of all mammalian erythrocytes. If you cannot make these slides yourselves, they may be purchased from biological supply houses.

Micrometry

Sizes of erythrocytes vary in different species and to a small extent even in the same species, though being sufficiently constant in any one kind of animal as to be more or less diagnostic. One cannot tell the source of a blood sample from size alone, since so many species overlap in this respect, but in many cases the search can be narrowed down. Gulliver gives the following as average sizes of erythrocytes from dried films of mammalian bloods: elephant, 9 micra, dog 7.3, rabbit 6.5, cow 6.1, cat 6.0, horse 5.7, sheep 5.0, and goat 3.7. The red cells of man average 7.5 micra, and are hence above the average for the class. Schafer lists the following measurements for forms below mammals, in which two measurements are necessary, the long and the short axis: pigeon, 14.7 x 6.5 micra; frog, 22.3 x 15.7; newt, 29.3 x 19.5; *Proteus,* 58.0 x 35.0; *Amphiuma,* 77.0 x 46.0.

Knowing the size of human erythrocytes to be 7.5 micra, and since scarcely a section of human tissues or organs can be found without encountering at least a few of these ubiquitous cells somewhere in the field of view, estimates may be made readily of sizes of other objects, such as the diameters of blood vessels and nerves, the thickness of an epithelium or the width of a muscle fiber. Erythrocytes are hence widely used in the approximate micrometry of structures encountered in histology and embryology.

Development

While the spleen, lymph glands and liver all serve as blood-cell-forming organs during embryonic development, the chief organ having this function in the adult is bone marrow. A smear preparation of this material, stained with Wright's, will show a great many forms of blood cells in their several

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stages of formation and will make a vastly instructive slide. Remove a leg or arm bone from a freshly-killed mammal, such as a dog or cat, and with a fine saw slit the head of the bone lengthwise. Smear the marrow over a clean slide or cover and proceed exactly as in making a blood film.

Other Blood Slides

The foregoing by no means exhausts the list of useful preparations in connection with the study of blood. There remain such slides as those showing fibrin, hemin crystals and other subjects and we will include directions for these from time to time in subsequent issues.

Trade Notes

Peculiarly appropriate to accompany our material this month on the study of blood is the receipt for review of *A Symposium on the Blood and Blood-Forming Organs,* by fifteen specialists, being all of the papers read at the Institute for the Consideration of the Blood and Blood-Forming Organs held under the auspices of the University of Wisconsin Medical School on September 4-6, 1939. Included are many studies on anemias, leukemias, polycythemia, infections, Hodgkin's disease, marrow cultures, coagulation and a historical paper. These collected treatises, many of them splendidly illustrated, constitute the latest and most authoritative word on these specialized and complex problems and the volume will go onto the "must" list of all readers interested in the blood and its diseases. The University of Wisconsin Press, 811 State St., Madison, Wis., $3.50.

For the first time since the inauguration of this Department in August, 1937, we are privileged to offer for distribution to our readers a strictly non-commercial publication. If you will send a 3c stamp to Julian D. Corrington, NATURE MAGAZINE, 1214 Sixteenth St., N. W., Washington, D. C., we will mail you a copy of Vol. I, No. 1, New Series, of *The Lens,* official publication of the State Microscopical Society of Illinois, resuming quarterly appearance after a lapse of 67 years. See the ASAM news below for announcement of our affiliation with this famous old organization.

This issue, of 12 pages, includes 16 articles, the cover reproducing a fascinating photomicrographic study of radiolaria, from Haeckel. Dr. Latham contributes a brief review of early microscopy and Dr. Gage, ASAM President, some notes on best dark-field effects. The chief article is a study of plasmolysis in cells.

The first commerical application of a special film coating to increase the light transmission of lenses has just been completed with the delivery of new projection lenses to twenty-five Loew theatres in the larger cities. Lester B. Isaac, Director of Projection and Sound for Loew's Theatres, ordered the new lenses for the first showing of "Gone With the Wind," after exhaustive tests by Bausch & Lomb had disclosed that screen illumination could be stepped up from 15% to 40% depending upon the type and focal length of the lens used.

Marked improvement in image contrast and sharpness of focus has been reported by Rochester projectionists who have been testing the new lenses.

Officials of Bausch & Lomb said that the new lenses have been made available in advance of their scheduled date of introduction in order to aid Loew's in securing greater screen brilliancy for the technicolor production of "Gone With the Wind."

Bausch & Lomb combines two processes in its method of producing non-reflecting lens surfaces, both having the same effect but differing in principle. While the inner glass-air surfaces are coated with a metallic fluoride, the outer surface is subjected to a corrosive process in which oxides of high refractive index are removed from the surface leaving a thin structure of silica.

In each case the coating is held to a thickness of a quarter of a wavelength of light. Since both the film and the lens reflect light it is necessary that the crests of the waves from one beam shall fall into the troughs of the other. Thus being out of phase the waves neutralize each other and reflection is eliminated. The missing radiation reappears in the transmitted beam which may contain as much as 99.6 per cent of the original radiation.

When a beam of light falls perpendicularly upon a glass-air surface from four to five per cent of the light is lost by reflection at each surface, the precise amount depending upon the color of the light and the type of glass used. A crown glass-air surface reflects about four per cent of incident light, whereas a flint glass-air surface reflects six per cent. The transmission in the first glass is 92 per cent; in the second 88 per cent. The Bausch & Lomb Super-Cinephor with its high aperture and the new glasses developed for its several elements will have its light transmission increased by approximately forty per cent, something of a revolutionary factor in projection optics.

Officials of the company stated that the new processes would eventually be applied to a number of instruments but that present production plans would be limited to a few in which complex lens systems promise a great increase in light transmission by the reduction of reflection.

American Society of Amateur Microscopists

President, Simon Henry Gage, Ithaca, N. Y.

Permanent Secretary, Julian D. Corrington, Chestertown, Md.

Official organ, *Nature Magazine*, Washington, D. C.

Address all communications concerning the Society to Dr. Corrington at Chestertown, Md. Application for Membership form sent on request. Dues, one year, fifty cents; two years, one dollar.

This month we have two announcements, each marking important forward steps in the progress of our organization. For non-members we are glad to report the appearance of ASAM Bulletin #2, the first informational publication issued by the Society, #1 being only a roster of membership. This will not be news for those who belong, since it will have been in their hands for almost a month preceding their reading of these words.

In making its bow as a journal devoted to the interests of amateur microscopists, the Bulletin proved so bulky as to require a flat mailing and classification as a book. The articles cover a very wide range, intended to interest beginners and advanced students alike. The issue was delayed considerably, owing to the necessity of solving the problem of providing inexpensive illustrations, reproduced from photographs, and one of the articles includes photo-offset printing with photographs which we believe entirely adequate. They were made for us by the Burgess Publishing Company, Minneapolis, several of whose offerings have been reviewed in this Department one time or another.

The remainder of the mimeographing, as well as the addressing and mailing, is the work of ASAM member Boyers M. Clark, Elkins, W. Va., who conducts a Letter Service. It is hoped that from now on issues will appear more frequently, four being planned for the year 1940, income permitting, and that members will be stimulated to contribute articles on their specialty.

The second announcement, primarily of interest to members, is our affiliation with the State Microscopical Society of Illinois, one of the oldest organizations of amateur microscopists in the world. This group was formed December 12, 1868, as the Chicago Microscopical Club, with 14 members attending the first meeting, and on April 23, 1869, the Club became incorporated under a state charter as the State Microscopical Society of Illinois. It is thus but little younger, as a corporation, than the Royal Microscopical Society, whose Royal charter was obtained in 1866. The New York Microscopical Society (see our issue of October, 1938, for a historical sketch) was incorporated in 1877.

The first conversazione was held on May 28, 1869, with about 500 guests. Some fifty instruments were used in exhibitions by members and others. The great fire of October, 1871, gave the young Society a severe set-back, destroying most of its property, but the will to survive was strong and it carried on, beginning the publication of *The Lens;*—see our offering this month in the *Trade Notes* section. In 1892, the SMSI became affiliated with the Chicago Academy of Sciences.

Details of the affiliation with the ASAM remain to be worked out at this writing, but the wedding is expected to benefit both organizations. Those of our members residing in or near Chicago are cordially invited to attend meetings and to join. Regular meetings are held every third Friday of each month at the Auditorium of the Chicago Academy of Sciences, Lincoln Park at Ogden Ave. and Clark St., at 8.00 P.M. The President and Editor of *The Lens* is J. E. Nielsen, 5517 Drexel Ave., Chicago, who has recently joined the ASAM.

Our membership has now passed the 450 mark and continues to show a healthy growth. With twice this enrollment and many new Chapters by the end of 1940, the Society will have passed successfully through its embryonic period and emerge to take its place among similar organizations elsewhere. It is up to all persons interested in microscopy and who would like to see such a body as this prosper heartily and long, to get behind the movement and lend support. Join; contribute an article now and then if you can; start a local Chapter in your community; and interest others in our work and aims. The more you put in the more you get out.